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Correspondence.—Wishing to make this JOURNAL a gazette of intelligent discussion to those of our readers who may wish to gain or give information on the subjects to which its columns are devoted, correspondence is solicited for publication from all who make the study of those subjects a pleasure or a profession.

The Public Lighting Tables of the American Meter Company will be found in the page advertisement of that Company.

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[OFFICIAL NOTICE.]

In the Matter of the Membership List, New England Association of Gas Engineers.

NEW ENGLAND ASSOCIATION OF GAS ENGINEERS,
OFFICE OF SECRETARY,
EAST BOSTON, MASS., November 25, 1906.

To the Members of the New England Association of Gas Engineers: Any member of the Association whose present address is other than that in the printed list of March, 1906, will confer a favor upon the Secretary by notifying him of said change.

N. W. GIFFORD, Secy.,
No. 26 Central Square, Boston, Mass.

BRIEFLY TOLD.

SECOND ANNUAL MEETING, NATIONAL COMMERCIAL GAS ASSOCIATION.—Mr. Lucius S. Bigelow, Secretary of the above named Association, informs us that its second annual meeting will be held the 8th, 9th and 10th days of next January. The sessions will be convened in the premises, Fifth avenue and 15th street, and a feature of the convention will be a good exhibit "of many types of gas burning appliances located in the large convention hall, and under the direct supervision of the Association." The floor space available for exhibits amounts to about 5,000 feet. A fine programme for the entertainment of the delegates and the Association's guests is announced. Secretary Bigelow may be communicated with at 265-267 Broadway, city.

CURRENT COMMENT.—

AT a meeting of the Albany (N. Y.) Chamber of Commerce, held some days ago, a set of resolutions was adopted declaring that the rates for gas and electricity in that city were excessive. To determine how best to advance a revision of rates a committee was appointed, consisting of Messrs. Wm. P. Rudd, Chairman; D. D. Ainsworth, John T. D. Blackburn, Rollin B. Sanford and James F. McElroy.

THE supply of gas to the residents of Clayton, N. J., was turned on the 24th inst., much to the satisfaction of the residents.

THE temporary appointment of Mr. Charles H. H. Stone, as expert to the New York State Commission of Gas and Electricity, has been made permanent.

A UNIQUE presentation scheme has been evolved by the linemen and meter readers of the Denver (Col.) Gas and Electric Company. They united in buying a handsome silver loving cup, which, after having been duly balloted for, will be awarded to the individual having the highest number of votes.

WE regret to chronicle the death of Mr. William H. Kutz, head of the office force of the Allentown (Pa.) Gas Company, whose death occurred at his home in Allentown the evening of November 20th. Deceased, who was born in Allentown, September 19th, 1873, received his education in the public schools of that city, and on graduating therefrom became identified with the office force of the Allentown Gas Company in an inferior station and eventually worked his way to the top.

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SMITHSONIAN DEPOSIT

If we mistake not, deceased was a nephew of Mr. W. W. Kutz, who was President of the Allentown Company at the time of its taking over by the United Gas Improvement Company, 20 years or so ago.

MR. L. C. HAMLINK, President and General Manager of the Gas Bench Construction Company, of St. Louis, reports that the Company has recently received contracts for bench work at Winona, Minn., Alpena, Mich., Sedalia, Mo., its second-order; Wooster, O., second order; and Marshalltown, Ia. The Company is also furnishing the linings for new water gas sets going into Louisville, Ky., San Antonio, Tex., Gary, Ind., Mason City, Ia., and Rockaway Park, L. I.

WE understand that the Public Service Corporation, of New Jersey, has about completed negotiations for the purchase of the plant and franchises of the Princeton Lighting Company.

THE Mississinewa Gas Company, of Union City, Ind., has been incorporated by Messrs. H. F. Dutton, Jr., F. H. Chase and John A. Shockney. It is capitalized in $50,000.

MR. HENRY REID, Chief Clerk in the Gloversville office of the Fulton County Gas and Electric Company, Johnstown, N. Y., will leave that position the first prox., having accepted a like position on the staff of the Tampa (Fla.) Gas Company.

THE gas plant of the Ballston Spa (N. Y.) Light and Power Company will be dismantled. Its discontinuance is prompted on the thought, in fact the knowledge, that if it were to be kept at work it would virtually have to be rebuilt.

"L. M. M.," writing from Montpelier, Vt., under date of the 21st ult., incloses the following: "A hearing was held before the Committee on Incorporations, Vermont Legislature, last evening, over the bill which proposes to regulate the lighting value and prices therefor that may be charged in the State for a supply of gas or electric lighting. The measure provides that the rate for gas shall not exceed $1.50 per 1,000 cubic feet, and that electric currents shall cost not in excess of 12½ cents per kilowatt hour. It is further stipulated that the lighting value of the gas distributed shall not be under 22 candles, and that the pressure under which it is distributed shall not be more than 2½ inches nor less than 1 inch at any distance from the place of manufacture. Considerable opposition was manifested at the hearing, such prominent men as Mr. F. H. Parker, of Burlington; Messrs. R. M. Brown and H. H. Blanchard, of Springfield, and G. L. Blanchard, of Montpelier, spoke against the measure. The principal speaker against the procedure was Mr. F. H. Parker, of the Burlington Gas Light Company, who urged that a flat rate of $1.50 per 1,000 could not be justly applied to the Companies, because of the difference in the cost of materials and disproportion in outputs. He declared that the candle power specified was excessive, in that the consumers' fixtures—they would not purchase new ones—were not adapted to the combustion of a gas so rich in hydrocarbons. The requirements in that respect in other States were far below the proposed Vermont standard, and also that the named pressure regulations were practically impossible, owing to the contours of the districts supplied. Mr. Parker's arguments were well backed up by other speakers, notably by Mr. Blanchard, of Montpelier. The hearing was an interesting one, and the Committee evidently, at the close of the discussion, was not quite sure that the proposed drastic measures were altogether even just or feasible."

MESSRS. JOHN EAKIN, of the Cairo City (Ills.) Gas Company, and Wood Rittenhouse, of the Cairo City Electric and Traction Company, have resigned from the named services to engage in the sale of gas fixtures and electrical fixtures and apparatus in Cairo City. They go on with their new enterprise February 1st, 1907.

MR. J. H. LARAMONTH, as Manager of the Peterborough (Ont.) Light and Power Company, has forwarded to the officials of that city the following self-explanatory proposal: "Gentlemen—The Peterborough Light and Power Company, Limited, are prepared to dispose of their business, and to give the city first opportunity of acquiring the same at cost, free from all incumbrances. If the city will purchase the business the Company will furnish the city power at $15 per horse power sufficient to provide for the present business and extensions of the lighting system for 3 years on the usual terms. The Company will further agree to furnish the city with an additional 500-horse power on the usual terms for manufacturing purposes at $15 per horse power for 3 years, as part of the above offer. The city may terminate such power contracts at any time on giving 3 months' previous notice in writing of its intention to do so."

THOSE interested in the electrolysis of gas and water mains will do well to keep track of the clever investigation now being carried on by the authorities of Chicago. The investigation is under the immediate direction of the City Electrician, Mr. W. F. Carroll. Quoting from the advices of our informant: "Randolph street was the first street chosen for the tests, each one of which showed an escape of current measuring from ½ volt to 5 volts." The main offenders are the Chicago Union Traction Company and the Chicago City Railway Company.

[AS FURNISHED BY THE OFFICIAL STENOGRAPHER.—Continued from page 935.]

PROCEEDINGS, FIRST ANNUAL MEETING, THE AMERICAN GAS INSTITUTE.

HELD IN THE AUDITORIUM HOTEL, CHICAGO, ILLS., OCTOBER 17, 18 AND 19, 1906.

FIRST DAY—AFTERNOON SESSION.

The President—Is Dr. Harrop ready to read the

REPORT OF THE BOARD OF REVISION.

Dr. H. B. Harrop, Chairman, then read lengthy extracts from the report of the named Board, the report having mainly to do with the section of its work relating to the "Distribution of Gas." The report is as follows:

GENERAL PROGRESS REPORT.

This work was inaugurated at the 1904 meeting of the Ohio Gas Light Association, at Cleveland, when it was proposed to organize a board to revise the Question Box (consisting at that time of 2 volumes) and combine with the condensed matter material from outside sources to frame up the beginnings of a gas compendium, or what we hope and now believe will grow in the course of years, with the general co-operation of the gas fraternity, into an encyclopedia of the gas industry During the year between March, 1904, and March, 1905, a board of 18 members was organized, and the task of laying out the forms and methods of procedure was completed. The work of interesting all the Associations and certain practical and scientific authorities was undertaken with a good measure of success, and the revision of the first and second issues of the Question Box was partly in type, when external causes outside the control of the Board brought the printers to a halt.

With the exception of those actually engaged on the revision no one can realize what an immense undertaking it has been. And it should not be forgotten that the work was done at odd moments by men whose time was fully occupied by their regular pursuits. The arrangement of the material into some definite order was a problem of the first importance. The selection of a suitable classification required much thought, and special attention is called to that finally chosen.

After a study of the chief text books, beginning with "King's Treatise," and of some "charge order" classifications familiar to gas men, a classification was outlined, which, after being tried out in our first compilation of the revision material, and undergoing some changes, finally took shape as below:

Coal.—Kinds, sources, examination, storage, handling.

Carbonizing (or Retort House).—Benches, carbonization, charging and drawing, operation of retort house as a whole.

Condensing and Scrubbing.—Theory, construction and operation.

Purifying.—Chemistry and operation.

Other Gases than Retort Coal Gas.—(a) oven gas; (b) wood gas, rosin gas, oil gas, etc.; (c) natural gas; (d) producer gas, such as the regular form, and Mond, Dowson, etc.

Water Gas.—Theory, construction and operation from handling fuel up to purification.

General Operation of Gas Works.—Enriching and mixing gases, testing finished gas, metering, storage, power and gas works machinery.

Residuals.—Coke, tar, ammonia, sulphur and cyanides, carbon, lampblack, waste heat, etc.

Distribution.—Distribution problems, gas flow, pumping gas, governors, mains, services and house piping, construction and maintenance.

Meters.—Design, construction, installation and maintenance.

Appliances.—Lighting, cooking, heating, water heaters, industrial and power.

Sales of Gas (and Commercial Policy).—Desirable and undesirable business, keeping existing business, getting new business, relations with consumers, collection.

General Commercial and Engineering Considerations.—Accounting and record in general, general business policy, labor administration, legal, rates, taxes, educational.

After the classification and method of revision had been fully considered and outlined sections of the work were assigned to the proper revisor, and thus each became responsible for the completion of the first draft of his own section. Prior to this the many references to current gas literature contributed as answers to the Question Box had been looked up, and abstracts bearing on the various subjects, together with other references procured independently, accompanied the assigned matter. After the revised sections had been completed they were exchanged among the members of the Board and subjected to further

scrutiny, so that the accuracy of no single statement should rest with any one authority.

The work done on the revision has not been done merely by the members of the Board. It was planned to interest every gas man known to have special experience in any detail of the industry. Aside from the correspondence carried on from the office of the Chairman, the sections took up the same style of campaign. The spirit in which the members of the gas fraternity and scientific authorities, both at home and abroad, met these advances has been most gratifying.

The question-and-answer form is not used in the revision. Instead, the material is distributed among the definite number of topics, beginning with coal in its relation to gas manufacture, and ending with the most general commercial considerations, following the order of a logical discussion. The topics have been kept distinct, one fromt he other, to facilitate criticism and further revision. There is no special section for purely scientific matters; these, along with costs, etc., being distributed through the work and treated immediately with the operations to which they relate.

Material drawn from the Question Box, from the proceedings of the various home and foreign gas associations, from works of reference and technical magazines, and special contributions specially made by others than the members of the board, are carefully credited both in justice to the authors and to enable anyone to trace back to authorities.

It will be worth while to reproduce an extract from a recent letter sent out to some of the members. "The original motion was that the Board should take the Question Box, cut out all the duplicated, superfluous or erroneous matter, rearrange what was left, and then add (from the existing literature of the gas industry and from the experience of the members of the Board) notes to round out the subjects treated. The idea was that the new material brought in by each yearly issue of the Question Box would constantly increase the size and value of the revision, which was to be made over each year.

From this starting point our aim expanded until we decided to lay the foundation of a complete treatise on gas manufacture, and this we ultimately hope to attain, not this year or next, but after repeated efforts. The material contributed to the first 4 issues of the Question Box has been very full and valuable on some subjects and very meager on others, and we found that if we confined ourselves to the material suggested the discussion would be as disjointed as a dictionary.

What we are trying to do then (say in the case of this distribution section) is to outline a complete, logical treatise on the subject and fill it in as fully as we can this year, but not overstraining ourselves to make it complete in this edition, because we know that we will have a chance to add to it in later editions.

The material on distribution that is to be found in the several issues of the Question Box is to be incorporated so far as it is of use to us, crediting each bit of information or opinion to the contributor as accurately as possible—generally using quotation marks when the exact wording is taken.

But while the Question Box was the starting point of the revision, and while we are using and will continue to use as much of the material from it as possible, it should be clear that the revision is not the Question Box, nor even a revised version of the Question Box, but aims to be (and will be in the course of time) a revised up-to-date version of gas literature and lore as a whole. * * * Above everything else we must be fair. We don't want to let anything that is undoubtedly wrong appear in the revision, but we have to remember that there are many variations in practice, and there is usually some bad and some good in each."

In conclusion, it will be sufficient to say that the work was rushed up to the 1905 meeting of the Ohio Gas Light Association, in expectation of publishing in time for that meeting. Since then the work has proceeded in a much more leisurely and careful manner, making excellent progress in some sections. The procedure since that date has been to merge the original revision volume with the matter newly condensed from the 1905 and 1906 issues of the Question Box, and the resulting compilation, together with additional matter gathered as before from other sources, is steadily growing in value.

I will merely mention certain sub-committees of the board, whose work was presaged in former reports: The Select Test Methods Committee, the Coal Mapping Committee, and the Indexing Committee. The first mentioned is tolerably well known.

The members of the Board who have been appointed and reported to date are:

J. D. Shattuck, Manager, Surburban Gas Co., Chester, Pa.
Henry I. Lea, Producer Engineer, Westinghouse Machine Co., East Pittsburgh, Pa.
Dr. F. Schniewind, General Manager, United Coke and Gas Co.
Chas. R. Faben, Jr.,[1] General Manager, Toledo (O.) Coke and Gas Co.
J. T. Mason, Superintendent, Third Ward Works, Milwaukee (Wis.) Gas Light Co.
Fred Bredel, Gas Engineer, The Fred Bredel Co., Milwaukee.
S. Tully Wilson, Manager, Improved Appliance Co., Denver, Col.
A. B. Slater, General Manager, Societé Anonyme du Gaz, Rio de Janeiro, Brazil.
Dr. H. B. Harrop, Chief Chemist, Milwaukee (Wis.) Gas Light Co.
F. W. Stone, Manager, Ashtabula (O.) Gas Co.
C. S. Lomax, Superintendent, Sharon Coke Co., South Sharon, Pa.
Byron E. Chollar, Engineer, Kansas City, Mo.
Henry L. Doherty, Henry L. Doherty & Co., New York city.
W. E. Steinwedell, Secretary, The Gas Machinery Co., Cleveland, O.
Irvin Butterworth, General Manager, Detroit City (Mich.) Gas Co.
Mastin Simpson, Kansas City, Mo.
G. W. Mead, Union Carbide Co., Chicago.
Geo. C. Hicks, Jr., Engineer, P. H. & F. M. Roots Co., Connersville, Ind.
J. B. Klumpp, Inspecting Engineer, U. G. I. Co., Philadelphia.
H. G. Stillson, Superintendent Distribution, Western United Gas and Electric Co., Aurora, Ills.
W. B. Tuttle, General Manager, San Antonio (Tex.) Gas Co.

With reference to the present publication, dealing with the distribution of gas, it is my duty and my privilege to call attention to the magnificent work done by Mr. F. W. Stone as Chairman of the distribution section. It was only on receipt of notice calling the first meeting of the Institute that it was decided to print this section, and less than 6 weeks' time was allowed to mould the material into shape for the printers. Mr. Stone has not only clearly grasped the general methods laid down for the prosecution of the revision, but has brought to the task an ability for analysis and classification that is of the utmost importance here. It must not be forgotten that this is the pioneer section of the revision; other sections that will be put forth later will be in a position to profit by the organization embodied in this, and will entail less labor because of the thought and work that had to be put into this section, in the nature of the case. No text book of distribution has ever before been written, and I bespeak for this one honest criticism, remembering the difficulties under which it has been brought out, and the co-operation of every man interested in the subject, to make the next edition better still.

H. B. Harrop, Chairman.

General Aspect of Distribution.

The Fundamental Problem of Distribution.—Given a network of pipe mains in a town having no marked differences of elevation, and assuming no consumption or leakage, it would be a simple thing to raise and maintain the same pressure at all points in the mains without regard to the location of the gas works. The whole problem of gas distribution arises from the fact that it is not a question of static pressure, but at keeping up pressures at distant points towards which the gas is flowing because it is escaping there through gas consuming appliances; and since the gas will flow through the mains only when the pressure is greater at the point or points of entrance than it is at the points of consumption, it is evident that the pressure in the areas near to the source or sources of supply will naturally be in excess of that in areas which the gas reaches after a longer travel. If the rate of consumption grows to be any appreciable part of the capacity of the pipes, a marked drop in pressure will appear, and the desired uniformity of pressure over the entire network of mains will suffer the more as the rate of consumption encroaches on the capacity.

The early distributers of city gas aimed to have a large surplus of main capacity and control pressures at all consumers' premises by regulating the pressure at the works. This system of distribution (based on a practically uniform pressure condition over the entire town and subject to control even up to the consumers' appliances by means of regulation at the works) has since been the prevailing type of distribution. The customary pressures carried averaging 2 or 3 inches of water column (about .1 lb. per square inch) in this type of distribution have led to its being called low pressure in contradistinction to the high pressure type introduced only in recent years, and carrying pressures usually ranging from 20 to 30 pounds per square inch from the works to the consumers' premises, and there reduced by individual pressure regulators on each service. Of course, pressure on the consumer's appliances in this case is independent of control from the works; and further, since the individual services are guarded by regulators, great inequalities and variations may be allowed to occur in the

1. Deceased.

street piping without interfering with the smooth working of appliances.

Most of the gas burning apparatus in existence to-day and working on city gas is designed for the pressure of 2 or 3 inches water column employed in the ordinary low pressure distribution system, and as a rule will not work properly except within such narrow limits. It is chiefly for this reason that, in the low pressure system it is of great importance to keep the same pressure in all areas, and of even more vital importance to keep that pressure constant. Inequalities among different areas, and variations in any or all areas hour by hour, both result from an unsatisfactory relation between capacity and consumption, but the latter especially from variation in the rate of sendout and efforts made to correct for it by regulating pressure at the source of supply.

In addition to the limitations of existing gas burning appliances, which cannot operate satisfactorily to the consumer on insufficient or excessive pressure, and are pretty sure in either case to give rise to complaints of poor service or "bad gas," we have to remember that the pressure carried bears relation to the loss of gas by leakage, to the strain that consumers' meters will stand, the cost of pumping gas, and the storage capacity of the mains. The ideal pressure that should exist at the head of consumers' services is discussed, '03—Q. B.—126, 106 and 123, and '06—Q. B.—516, and seems to be about 25-tenths water column, with a minimum variously stated as 20-tenths, 16-tenths, and in one exceptional case, 10-tenths. As the maximum pressure that should ever exist in a main directly supplying consumers, W. Forstall ('06—Q. B.—557) gives 45-tenths.

For natural gas, 6 ounces, say 100-tenths, is generally accepted as satisfactory. The consensus is that the ordinary tin meter may be used safely at a pressure of 1 pound, or 28 inches water column, providing the pressure is not subject to sudden fluctuations.

Allowable variations in pressure consequent on variable consumption are stated all the way from the extremely conservative figure of 10 per cent. of the minimum up to 100 per cent. of the maximum ('05—Q. B.—564). Eysenbach (same reference) states that an absolute variation of 1 inch is allowable and reasonable, but points out that a variation of 3 or 4 inches in the neighborhood of the works, though not good practice, is common. "With 2.5 inches for an ideal figure, pressure should not be allowed to get higher than 4.5 inches and not lower than 2 inches." ('06—Q. B.—516).

There is recently a general tendency toward a slightly higher mean pressure throughout the streets than was formerly considered good economy.

Methods of Attaining Suitable Pressure.—The momentary rate of sendout varies with the time of day, the days of the week, holidays, the weather and the seasons; it is also influenced strongly by the different classes of consumption, lighting consumers pulling heaviest in the early hours of the evening, cooking consumers at meal times, and industrial during the working hours of the day. For the same reasons the areas of greatest consumption shift somewhat about the town.

The capacity that the mains must have depends less on the total amount of gas delivered during the year than on the maximum demand, or the magnitude of the peaks in the load curve. Capacious mains installed to take care of the peaks tend more or less to lie idle during the valley periods, but the interest on the full capital investment goes on unabated, as does also the depreciation. All this is influenced largely by the foresight used in planning, and as a basis for estimating it is imperative to have a good approximate notion of what the average maximum demand per consumer will be. In '03—Q. B.—112, Doherty discusses three sets of load curves and sums up thus: "I would assume, from my present available information, that in figuring the maximum demand for ordinary domestic consumers it should be 100 feet per hour for one consumer. Where two customers are supplied from the same main it is hardly likely that their peaks will occur at the same time, so in planning distributing pipe it would not be necessary to allow more than 75 feet per hour per consumer. As the number of customers supplied by the same pipe is increased, the maximum demand can be diminished, the greater the number, until only 20 feet per consumer must be allowed."

When the existing mains begin to prove inadequate as the town grows it is time to replace them with larger mains, or put in one or another of the various types of feeder systems, or else run the pressure up on the street mains and install individual regulators on the services wherever needed.

Replying to question whether the last mentioned method is desirable if the cost of regulators can be kept below $2 per service ('04—Q. B.—104) Walton Forstall says: "This question cannot be answered 'Yes' or 'No' as an abstract proposition. The sole idea of a service or house regulator is to insure the supply of gas under proper conditions of pressure. If such conditions do not exist at the head of each service; in other words, if the location of the works, or the size of the mains, either or both, is such that some or all of the consumers are subject to more than permissible variations of pressure through the 24 hours, then it is a question of relative economy in first cost and operating expense, whether the proper pressure regulation be attained through service regulators or through changes in the main system. It is easy to be seen that where the services are very numerous per mile of main, a charge of $2 per regulator, with say 25 cents as an annual operating charge, would make the regulation of pressure by means of a better main system the more economical method."

A property operating in one city two or more gas works widely separated has a distinct advantage, in that distances and the dimensions of the regions to be served by one works are diminished. This same end is sometimes accomplished where there is only one works, by erecting a district holder at the farther extremity of the town and pumping gas from the works into the holder through a special, independent line; the holder then feeds its own neighborhood.

A still more satisfactory mode of practice, and one that has found wide application very recently, is the "loop" or "spine" booster system. An independent line starts from the works and pierces or encircles the areas of greatest consumption, branching, if need be, to reach isolated districts, and gas is pumped into this line at 10, 20 or more inches pressure, depending on the conditions, to be fed out into the street mains through governors located at strategic points and set to maintain in each case the pressure found most desirable around that point. This has the virtual effect of subdividing the town into a number of districts of more reasonable area. Properly planned and operated, such an arrangement gives a uniformity of pressure on consumers' apparatus only surpassed by an equipment of individual regulators on each service. Another of its advantages is that with a uniformity of pressure in the network of street mains and the resulting absence of areas of excessive pressure the gas lost by leakage is diminished.

In the average city the booster line has to be kept under pump pressure only during peak periods, and the cost of pumping is limited by the hours when reinforced pressure is required. The amount of pressure to be raised by the pumps is only that necessary to get the gas to the district governors with sufficient excess to operate them as set; this feature is naturally an advantage in point of operating cost over the true horse power type of distribution.

Flow of Gas Formulæ.—The importance of a wholly trustworthy formula to express the relations existing among quantity of gas, length and cross-section of pipe, and inlet and outlet pressures, can hardly be overestimated. The most commonly used formula was derived by Dr. Pole upwards of 50 years ago, chiefly from an analytical consideration of certain accepted laws and constants of mechanics. The Pole formula has proved more than reasonably accurate within the limits of diameter, length and pressure contemplated by its author. For the more recent conditions (referring particularly to high pressures) it has been found necessary to produce other and special formulæ to fit special cases. It seems within the bounds of possibility that a formula so complete as to fit all cases may be deduced in time, but thus far it has not been done; and varieties of special formulæ are in use, the user as a rule accepting the one he is employing as perfectly general. Nearly 2 years ago Mr. Shattuck undertook to collect these so far as possible for the Board of Revision, for purposes of comparison, and looking ultimately to the derivation of a general formula. He writes: "I feel that this resume is not by any means complete, and that considerable further study can be put on it to good advantage in the future; and I will undertake to devote some time to this subject each year and keep it up-to-date. I find that the great trouble in using the various high pressure formulæ is that care must be used to understand the characters, which may mean entirely different things in the different formulæ. They vary in this particular in most every instance, and range from gauge pressure in pounds to absolute pressure in feet of water, from cubic meters per second to cubic feet per hour, and from length in feet to length in miles." It is to be noted that a long step has been taken toward uniformity of symbols, and the attached list indicates clearly the powers of the several letters and signs.

Report by J. D. Shattuck.—

Q = cubic feet delivered per hour.
P_1 = absolute initial pressure (14.7 + gauge pressure) pounds per square inch.
P_2 = absolute terminal pressure in pounds per square inch.
P_3 = gauge pressure initial in pounds.

P_g = gauge pressure terminal in pounds.
D = inside diameter of pipe in feet.
d = diameter in inches.
L = length of pipe in miles.
l = length of pipe in yards.
l_f = length of pipe in feet.
W = weight of 1 cubic foot.
c = constant.
π = 3.1416.
T_0 = absolute temperature at maximum density of water; 461 + 37 = 498° F.
T_1 = absolute temperature of gas after delivery.
T_2 = absolute temperature of gas flowing in main.
g = specific gravity; air = 1. To correct formulæ for other specific gravity than that given multiply result by:

$$\sqrt{\frac{\text{g in formula}}{\text{g of other gas}}}$$

In the following formulæ I have substituted the above designations so that they may be more easily compared.

Pittsburgh Formula.—This was furnished through the courtesy of Mr. Peter Young—it assumes a gravity of 0.6, which is that of natural gas.

$$Q = 3{,}450\sqrt{\frac{d^5 (P_1^2 - P_2^2)}{l_f}}$$

Cox Formula, from which Cox's gas flow computer was calculated, assumes a specific gravity of 0.65 and was furnished through the courtesy of Mr. R. B. Brown.

$$Q = 41.3\sqrt{\frac{d^5 (P_1^2 - P_2^2)}{L}}$$

F. H. Oliphant's Formula, as given in his report on natural gas, 1902 (advance pamphlet of U. S. Geological Survey, page 20; see "Progressive Age," June 1, 1904, page 269), is adapted for an 8-inch natural gas main and specific gravity of 0.6. For any other size main $d + \frac{d^2}{30}$ is substituted for d^5, which allows for greater delivery from large mains. For a gas of any other specific gravity, 0.6 ÷ g is inserted as a factor under the radical. The reference above given contains a table for facilitating the use of the formula:

$$Q = 42\sqrt{\frac{d^5}{L}(P_1^2 - P_2^2)}$$

Prof. Robinson's Formulæ.—The first is for absolute pressures, the second for gauge pressures with the additional correction for difference of temperature at entrance and exit. Both have been developed from natural gas practice and, consequently, contain the correction for specific gravity.

$$Q = 48.4\sqrt{\frac{d^5}{L}(P_1 + P_2)(P_1 - P_2)\frac{0.6}{g}}$$

$$Q = 48.4\sqrt{\frac{T_1}{T_2 T_0}}\sqrt{\frac{d^5}{L}(p_1 + p_2 + 30)(p_1 - p_2)\frac{0.6}{g}}$$

Prof. Unwin's Formula is given in the *Gas World*, June 11, 1904. The pressures are in feet of water and absolute; the diameter and length in feet; the co-efficient of friction, c, is equal to $1 + \frac{1}{12d}$; Q is given in cubic feet per *second*.

$$Q = \frac{\pi P_1}{4 P_2} D^2\, 468\sqrt{\frac{D}{c g l_f} \times \frac{P_1 - P_2^2}{P_1^2}}$$

Mackay's Formula.—In his article on fans in gas works in the *Journal of Gas Lighting*, Feb. 24, 1903, R. Gordon Mackay transforms Unwin's general formula, W being the weight of 1 cubic foot of gas.

$$Q = 1{,}350\sqrt{\frac{d^5 h}{1.8\, W l_f \left(1 + \frac{3\,6}{d}\right)}}$$

He says that Pole's formula is probably more accurate.

Dr. Velde's Modified Pole's Formula, as given in *Journal für Gasbeleuchtung*, Oct. 1, 1904, gives Q in cubic meters per hour, h in millimeters of water, l in meters, and d in centimeters. The *Journal of Gas Lighting* gives the translation of this formula into English units as follows:

$$P_1 - P_2 = 393.7\left(\sqrt{1 + \frac{l\, g\, Q^2}{360{,}530{,}000\, d^5}} - 1\right)$$

Richards, in his book on "Compressed Air" (1885), gives the following formula for the delivery of compressed air and applied to gas by introducing the factor g:

$$Q = 60\sqrt{\frac{10{,}000\, d^5\, c\, (P_1 - P_2)}{g\, l_f}}$$

A table is also given showing values of c corresponding to different values of d.

Hiscox gives a compressed air transmission formula in his book on "Compressed Air" (1901) as follows:

$$Q = 60\, c\sqrt{\frac{d^5 (p_1 - p_2)}{w\, l_f}}$$

Special tables are given to aid in the use of this formula also.

L. P. Lowe gives a high pressure gas distribution formula in his Pacific Coast Gas Association paper (see "Progressive Age," October 1, 1904), which takes into consideration the effect of compression; 0.0761 is the weight of 1 cubic foot of air at 14.7 pounds atmospheric pressure.

$$Q = c\,\frac{P_2 + 14.7}{14.7}\sqrt{\frac{d^5 (p_1 - p_2}{0.0761\, g\, l_f \left(\frac{P_2 + 14.7}{14.7}\right)}}$$

c depends on d thus:

d =	0.5	2	3	4	5	6	7	8	9	10
c =	36.8	52.7	56.1	57.8	58.4	59.5	60.1	60.7	61.2	62.1
d =	14	16	18	10	22	24				
c =	62.3	62.6	62.7	62.9	63.2	63.2				

Pitot Tube determinations have also been used, especially on natural gas mains. The method is well described by W. B. Gregory, of New Orleans, before the American Society of Mechanical Engineers (see Vol. XXV. of the "Transactions)." F. H. Oliphant also describes it in his report on natural gas above noted. The formula of the Pitot tube as applied to gas measurement has been very carefully determined by Prof. S. W. Robinson, whose report is published in the Geological Survey of Ohio, Vol. VI., p. 548. The final formula, calculated for gas at 0.6 specific gravity and a temperature of 50° F., is

$$Q = 1{,}690\, d^2\sqrt{h\left(1 + \frac{P}{15}\right)}$$

All the above formulæ were derived from Dr. Pole's formula, and are more or less successful attempts to add corrections for density and co-efficients of friction due to compression. The more complicated formulæ are simply attempts at greater refinement. It has come to be pretty generally understood that each size pipe requires a change in the formula to give the particular result obtained. The coefficient of friction does not seem to vary with different densities of gas, but varies with each size pipe. Unwin says that the coefficient of friction varies with the roughness of pipe, diameter and velocity, and I would add, possibly density.

I believe that the formulæ recognizing a different coefficient for each size are the most accurate. I do not believe the full accuracy of any formula is yet established. Accurate results from actual tests should be kept by some one, and tabulated until a true formula can be secured. Until such time practical working results can be had from the best natural gas practice, as embodied in Prof. Robinson's formulæ, and Cox's Computer also, which gives safe results.

I have noted 3 records, the accuracy of measurement of which I do not know. At Newton, Mass., a 6-inch pipe line, 9,600 feet long, 10 pounds per square inch initial gauge pressure, 9.28 pounds final gauge pressure, delivered 18,200 feet per hour.

At Chester, Pa., a 6-inch pipe line, 7,514 feet long, 27 pounds initial gauge pressure, 25.5 pounds final gauge pressure, delivered 20,100 cubic feet per hour. (Not satisfied with accuracy of measurement.) Mr. Oliphant says he checked his formula on delivering natural gas 100 miles into a gasholder through 8-inch pipe. Taking the Newton conditions, and using the several formulæ, we obtain the following results:

Formula.	Calculated Cubic Feet per Hour.
(Actual volume delivered)	(18,200)
Pittsburgh	18,380
Cox's	16,000
Oliphant's	16,260
" corrected	17,510
Robinson's	18,730
Unwin's	31,870
Velde's	22,060
Richard's (corrected for 0.6 gravity gas)	18,708
Hiscox's (corrected for 0.6 gravity gas)	16,250
Lowe's	26,910

I am indebted to Dr. H. B. Harrop for considerable assistance in obtaining several of the above formulæ.

Pumping Gas.—Only a few limiting conditions will be given, with a classification according to the services.

Foul Gas.—With suction pressures in tenth of an inch water column, and discharge pressures amounting to only a few inches, this is purely only a rotary positive blower proposition. The vital points here are close governing to protect the hydraulic main seals, and machine construction such that there can be no fouling from tar. Higher speeds by 50 per cent. than heretofore used would ensure better governing, while allowing for greater variation of output.

The cooler the gas is handled the less capacity will be necessary in the machine. Where the meter measurements are used to figure the required capacity of the exhauster, the volume at the pressure and temperature at the machine should be calculated with allowance for shrinkage due to condensable matter dropped, and 10 per cent. for actual slip in the machine. Sufficiently close results may be obtained by using the formula:

$$v = \frac{17.64\ (h - a)}{460 + t}\ V$$

Transfer of Gas from Holder to Holder.—For pressures not exceeding 8 or 10 inches water column, a centrifugal blower may be used; for pressures over that the rotary positive blower will be more satisfactory. The constant speed machine is the correct application here, and close to maximum speed may be used unless a margin is specially desired. In large stations three machines, any two being of sufficient size for the work, should be used. This is especially true of gas engine outfits, for the economy of large and small units differing but little, subdivision in the above proportions is wise and not too costly.

Trunk Line Work.—The conditions usually vary from 2 to 6 pounds; and high speed, high pressure rotary positive blowers are most suitable. Either constant or variable speed machines are permissible, the constant pressure machine seldom being necessary, except as a protection against excessive pressure, due to stoppages of any kind. Here an automatic by-pass is ample protection; though a diaphragm regulator that can be changed readily is an advantage under certain circumstances. Efficiencies vary from 75 per cent. to 92 per cent., according to size and pressure.

Transmission Lines, 10 Pounds and Up.—The real problems of pumping gas begin here. Up to 10 or 12 pounds the positive rotary gas pump should be considered. Simplicity, flexibility and first cost may be balanced against increased cost of attendance, valve complications and adiabatic efficiency. Above 12 pounds the field belongs to the reciprocating compressor, unless some unusual condition would justify compounding the rotary blower. The balance of the problem is a question of fuel against cost of pipe; small pipes and high fuel account; large pipes and low fuel.

[To be Continued.]

(Continued from page 941.)

FOURTEENTH ANNUAL MEETING, PACIFIC COAST GAS ASSOCIATION.

HELD IN SAN FRANCISCO, CAL., SEPTEMBER 18, 19 AND 20, 1906.

SECOND DAY—AFTERNOON SESSION.

The convention was called to order at 2 P.M., Mr. L. P. Lowe in the Chair, who introduced Mr. C. E. Moore, who read the following paper on

PERSONAL EXPERIENCES WITH A MUNICIPAL GAS PLANT.

The town of Santa Clara has the only municipal gas plant on the Pacific Coast, so far as known to the writer. There is nothing remarkable about this plant except the fact that it is owned and operated by the municipality. The writer has for several years been acting as consulting engineer for the town, and as such had charge of the construction of the water and electric plants which preceded the gas plant. When gas was taken up it naturally followed that the same arrangement was carried along as regarded that plant also. Therefore, it will be understood that the engineer, as well as the council, had much of the gas business to learn, and that the writer of this does not assume to be an expert in gas matters. However, having been identified with the enterprise since its establishment, and continuing at present to be in touch with it, and since the plant occupies rather a unique position, it has seemed that a brief account of its career may be of interest. The account will naturally fall somewhat into the line of a discussion of municipal ownership, but this will not be with the object of establishing any extreme views, but rather with the idea of drawing such inferences as are possible from our experience. Regarding the broader question of general municipal owership, the writer has come in contact with it in many other places, and inevitably his views are somewhat colored by the sum total of all this experience, but the effort will be made here to confine deductions as strictly as possible to those following from this case. To make the situation clear, it will be necessary to first state, in a brief way, the causes which led up to this particular municipal ownership. Twelve years ago the town of Santa Clara took up the ownership of water supply. For this there were several powerful reasons, the chief one perhaps being the necessity for better fire protection. This plant was successful from the start. There was also a desire for a more extended system of street lighting, and it seemed advisable to take that up in connection with the water plant. This plant was installed 10 years ago. It also was satisfactory, and the people came to have considerable pride in the plants. Every town, like an individual, likes to have something to talk about, and the municipal plants came to be the thing to talk about in Santa Clara. The matter now passed beyond the case of necessity, and the later movements along this line have been largely the result of the impetus of the idea. Municipal ownership became a specialty. Commercial lighting was taken up by buying out the property of the electric light company, remodeling and extending the system, and combining it with the street lighting. Current for this purpose was formerly generated by the town, but for several years past has been bought from the San Jose Light and Power Company, and it is supplied by the standard long distance transmission lines. Gas had been supplied by the San Jose Gas Company (later the Light and Power Co.) for many years by a pipe line from their works. The condition of the town had been such that there had been little encouragement for the Company to extend the lines. There had been no special effort to push the business, and the consumption was only 10,000 feet per day. However, with the coming of renewed life to the town, there began to be felt a desire for more extended service. Chiefly, the development of the gas plant may be considered as due to the idea which had taken root. There was no particular dissatisfaction with the Company, and the movement was entirely devoid of enmity to it. Accordingly all the property of the Company in the town was purchased at a valuation made by an expert agreed upon by both parties. The transaction was amicable and satisfactory throughout. There has since been considerable increase in the consumption (chiefly for fuel purposes) and the output is at present 35,000 feet per day. The price of gas was at first fixed at $1.75 per 1,000, that being the price then charged by the Company. Later, for service in San Jose, the Company made the rate of $1.50, but no reduction was then made by the town. Still later the Company reduced the rate to $1,25, and the town followed with a reduction to $1.50, and now selling at that rate. That is to say, the town has in the matter of rates pursued a very conservative course, and has made no reduction until virtually forced to do so by the Company. Of course, there is no actual competition between the two, but inasmuch as they serve adjoining territory, it is in practice difficult to maintain a much higher rate in one than in the other. It will perhaps be apparent from the foregoing that an attempt has been made to manage the plant on business principles, and not to be carried away by any popular idea that something could be had for nothing. About 20,000 feet of pipe was taken over from the Company, and since that time about 50,000 feet have been laid. It has been necessary to do this work largely with unskilled labor. At the beginning the work done in remodeling the distribution system was from necessity advertised. The contractor who took the work was not accustomed to laying gas pipe. The blocks in many cases have very little fall, barely enough for surface drainage. Under these circumstances the writer put in force a system of laying to grades previously established by levels, and this system has been followed ever since. This is done so simply, with so little trouble, and with such good results from entirely unskilled labor in grading the trenches, that it would seem good policy for any company working in a flat country to follow the same system. In the old pipes, laid in the old way with a spirit level there have been frequent traps and stoppages. In the new mains there have not been any at all. The number of drips is also kept at a minimum, and these are located at convenient points and where they will do the most good. It may be that some gas companies use similar methods, but so far as known to the writer they generally do not. The particular methods used had previously been developed for use on sewer work. Now, as to the conclusions from our experience:

First; the plant and business need continual and watchful care.

This is, of course, an entirely unnecessary thing to say to men of experience, but it is a fact that is not fully appreciated by others. In our case the care has been provided, and consequently the business has been successful. It has been very fortunate that there were few changes of officials. The office of President of the Board (or Mayor) has not changed during all this time. The Chairman of the Water and Light Committee also has from the first been identified with the management. Questions of policy have been given careful consideration; just as careful as though it had been their own business. The result has been a good profit, but it is very easy to see how the balance might have been the other way. This is the chief danger that confronts any scheme of municipal ownership, namely, that men of ability may not be willing to give their attention to the business of the town or that the people will not have the good sense to keep men of that kind at the head of affairs.

Second, as to the ability to meet emergencies. We have recently had an experience of that kind growing out of the partial wrecking of all the plants by the earthquake. This rests upon the men, and not upon the system, and consequently goes back to the first question of management. In our case we feel no cause for regret, inasmuch as water was supplied in about 24 hours and gas in 3 days.

Third, the ability to provide extensions. In this particular the municipality is decidedly at a disadvantage. Whereas a company can in this case borrow money to meet a large increase in the demands upon it, a municipality cannot do this except by a bond issue, which cannot be resorted to in all cases. Consequently it is necessary to look well ahead, and provide far in advance for such extensions of magnitude as are likely to be necessary.

Fourth, as to the attitude of customers. In these matters we are dealing not only with gas, but with human nature, and this is practically the same the world over. There is an occasional demand for lower rates, in the case of the town, as there would be with a company. There is the same distrust of meters. About half the consumers consider the collector and meter reader their natural enemy. The people's pride in the plant is chiefly in the abstract, and does not particularly affect their attitude toward bills and service. And yet it is not quite fair to leave the question at that, for there is a certain amount of feeling of individual ownership, which probably makes the conduct of these matters a trifle smoother than in ordinary cases.

Fifth, general conclusions. The conviction of the writer is that a municipality should hardly be advised to undertake the management of plants solely for the sake of profit, as an individual or company may do. There should in general be other and stronger reasons. In the case of water, there often are such reasons. As we leave water supply and look along the line of other utilities, we find that in general these causes have less force. This does not mean that gas should be supplied at cost. In the first place, in a developing community, extensions and increased facilities in every way will probably be called for. If gas is supplied at cost, all this must either be provided for in the first bond issue, which on account of its uncertainty is not practicable, or must be provided by taxation later.

Secondly, the question of exact cost is a precarious one at best. It must include all unexpected and emergency expenses, and can really be determined only after a term of years. The probability is that selling at cost, as determined from ordinary running expenses, would finally result in the plant requiring support from other funds of the town.

To condense all this, we would say that a municipality, like an individual, should act with judgment and upon competent advice, and not be carried away by impulse in either direction. This is perhaps a condition which cannot be fully realized, but in this as in other affairs of life it is well to have an ideal.

Discussion.

Mr. Lowe—This most excellent paper at the hands of Mr. Moore is before you. I believe the Pacific Coast Gas Association enjoys the distinction of being the only one which includes in its membership a municipality. We welcome them with open arms, and for the first time, I think, in the history of the gas world, we have had a paper from a municipal ownership man, who would be glad no doubt to answer any questions you may desire to ask.

Mr. Berkley—I want to say in connection with this paper that, in the first place, it is a consideration on our part as independent operators that Mr. Moore has put it in a very serious and sensible way. The first thing that struck me was they are selling gas for $1.50 per 1,000. That does not just exactly meet the ordinary demand of municipal ownership, but he rightly says in the wind-up of his statements that they cannot afford to sell it at a less figure, because of conditions overlooked by the ordinary individual when they are talking municipal ownership. I know that in the Middle States, where municipal ownership has been agitated, the claims were made that we must have gas at cost. To the ordinary layman that statement meant something, but it did not mean anything except financial failure. I think the gentleman is really entitled to a great deal of credit, for while he states the price, he also states that it cannot be sold at cost. They are operating at some profit; but, of course, he did not say how much. Inasmuch as the mayor has acted in the same capacity for 10 years or more, we would hardly consider that this is a fair test of the word municipal ownership, because it has been under the control of the same hands so long. Ordinarily municipal authorities are changed and new men brought into office, but in this case we must give them credit for continued service of the same men. I admire the paper very much, and, as Mr. Lowe says, it is the first paper introduced in a gas convention of this character and nature.

Mr. Britton—As probably every member of the Association knows, I have been a strenuous opponent of municipal ownership for the past 25 years. I have written volumes myself in opposition to it, and attempted to show up the fallacies of the reports which were made by municipalities, covering their costs, particularly of electric light plants. I was induced to ask Mr. Moore to write this paper by having gone over the reports of the town of Santa Clara, setting forth the results of their operation of both their water and gas plants and electric light, and moreover because of their fairness in buying current from the San Jose Light and Power Company and the United Gas and Electric Company for the operation of motors, etc. It showed a broad spirit and fairness that I had not met with in other advocates of municipal ownership. I knew Mr. Moore would bring out something worth listening to. If all of the municipal ownership plants in California would be as frank, honest and fair as the Santa Clara plant we would have nothing to fear in the way of municipal ownership. It is readily observable that, where the conduct of corporations changes, it very seldom makes any advance, excepting against its own will, in a degree, and the fallacy of success in municipally owned plants is due primarily to the lack of management, of government and of knowledge. In all municipally owned plants in California a man seldom holds his position, even as engineer in the plant, for a longer term than the term of his friend in the council or trustees, and there is no incentive. They are very careful, however, and it has been the habit of all of these towns to hide actual expenses. They are very careful to avoid the question of expenses of operation of one utility by charging interest to the other. I have in mind a town in California, in this case having a water and electric light plant, that is very careful to charge to the expenses of the water plant any surplus of expenses over receipts in the electric light plant, because the water plant can bear the burden of expense where the electric light plant cannot. I do not think that in California we need have any fear of a very great stride in municipal ownership, if the companies in the State will study their own interests. The policy of the gas and electric light men to-day is very much broader than it was a few years ago. It is broadening every day, not only in the reduction of rates to pay interest on capitalization, but it is broadening in their line of duty to the municipality. It has generally been said that the municipal action was a good thing. Prices ordinarily were charged in times past to municipalities by gas and electric light companies far in excess of the rate which was given to private consumers, and that made necessary the enactment of statutes now in force in California in nearly all of the charters in all of the cities providing that a city should pay no more for its commodity than is paid by the most favored company, and gas companies forced that issue upon themselves, and they forced mnnicipal ownership by the little exactions that merely antagonize. I think all over the world to-day that the question of municipal ownership is easing up with us as to our particular industry. I think they are looking more to the requirements of other utilities that present a better opportunity of profit with less engineering skill and talent to carry it through. There is a commission now, I think it is in active operation, that is composed of pro-municipal men and anti-municipal men, and they in turn selected others who were unbiased and unprejudiced, and they have started an investigation of plants in Europe and propose to finish their investigations here in America. It is anticipated that it will take some 4 or 5 years to collect all the data, and I think that since it was organized they have taken up also the question of street railways, so that we will have, within a short time, practically a board of arbitration, and statements that will enlighten the public as to whether municipally conducted plants can be admitted to be as economical in the end as privately owned plants.

Mr. Moore—Regarding the question of profit, I have here 2 or 3 copies of the clerk's statement for this year; I havn't very many, but I will leave them with the Secretary. All the information is perfectly open, and you are perfectly welcome to take it. It is a fact that these plants are operating under more economies than they would under ordinary cases, from the fact that there are 3 plants operating together, which is quite an element of economy; also, as the gentleman remarks, it is not a fair test on account of the officers having continued in office through the entire term of 10 years, and that is very fortunate. I mentioned that in my paper. It has been extremely fortunate for the town that this has been so, and also it has been fortunate that we have had exceptionally able men at the head of the board, as many of you know. I also called attention to the fact that the business is practically the same, whether conducted by a municipality or by a private company, and that the same difficulties have to be met with, and people will not be satisfied. People want to get a good deal for their money, whether it is from a municipality or whether from a private company. I agree with Mr. Britton that there is a reaction taking place toward municipal ownership, and particularly as regards gas and electric lighting plants. I think there is no probability of any great progress in municipal ownership in that line for a long time to come.

Mr. Berkley—How do you arrange for renewals and extensions? Do you have a sinking fund upon which you can draw?

Mr. Moore—All the collections are turned over to the general fund. So far that has been able to carry everything, and unless something very unlooked for comes up, and by being careful and using the funds for certain purposes, they should be able to provide for extensions.

Mr. Berkley—Do you charge anything for depreciation in the profit and loss account?

Mr. Moore—No. I find in looking over the clerk's statement he has not included anything for depreciation, which I think should be done. He has allowed interest for the full value of the plant, which is not always done in municipally owned plants.

Mr. Lowe—I am very familiar with the situation at Santa Clara, and from my observations I can say that the operation of the municipal plant is very much the same as though it were privately owned. Business men are fortunately in charge of the politics of Santa Clara, and the same ones have been retained in office for a great many years, and the water, gas and electric light plants are handled as they would handle their own business. The town has been very fortunate in that respect. They recognize the fact as well that it is unfair to privately owned companies to claim results which they have not acquired in practice, and they have published their statements fully, comprehensively and fairly. It is the only instance within my knowledge where a municipality has stated the case exactly as it exists.

Mr. Kuster—A point I think it would be well to mention is that the gas to these consumers is measured through the same kind of meters that all of us use, and they are expected to pay their bills. I have been amused in listening to different voters express themselves. They seem to think that the gas should be delivered to their houses free of cost to them; that the town should pay for it; that it should come out of the general taxes. A great many people seem to have that impression who are advocates of municipal ownership.

Mr. Lowe—I think this is one of the instances where we should offer a vote of thanks to Mr. Moore. As I said before, it is not only infrequent indeed in the history of the gas business that we are not only enabled, but glad, to welcome on the floor of a convention a municipal man. [Motion carried.]

The Acting President—I will state before proceeding with the next paper that the Committee on Awarding the Association Medal will be expected to report at the banquet this evening. We will now listen to the paper by Mr. S. P. Hamilton, on the

BEST METHOD OF PROMOTING GAS SALES.

One of the objects of this paper, which from the title must necessarily cover a broad field, is merely to invite open discussion and thereby enable the writer, as well as others interested, to obtain more knowledge of the methods which are as varied and successful as there are varied and successful types of gas managers represented in this convention.

A discussion of good business methods for further increasing gas sales should include a statement of the present flourishing condition of the gas industry made possible by the marvelous amount of energy and ingenuity expended by the engineering profession during the last half century as a result of which processes have been evolved for the production of gas at an enormously decreased manufacturing expense; for the distribution of gas through single distributing systems which furnish immense cities and chains of towns and villages with an ample supply of clean, rich gas of uniform candle power and pressure; a system of complaint service which anticipates defective service troubles and an attitude by the company in general of giving value received and extending every possible courtesy and consideration to the great public who are paying the stockholders' dividends and the gas man's salary. This policy towards the public of being "At your service," having been fulfilled in such a perfect degree by the Coast gas companies, has alone made possible the favorable showing by the commercial gas man, the man who steps in at a time when the operating department seems to have reached the culminating point of improved processes and helps to continue the steady and healthy growth of the business through discovering new outlets for the gas product in the lighting, heating and power fields, and applying methods of encouraging its usage.

California climate and the "earthquake clause" have helped to "boost" the local gas appliance men into a place of undue prominence, and while we are so busily engaged in "whooping up" the business all these favorable conditions have made possible, as to quite believe that we are the whole cause of the large business being done to-day, it remains a fact, that the "good service" showing of our Company is the responsible factor. With the same conditions prevailing in two companies, I believe that the company having an aggressive commercial department, the company which controls absolutely the sale of gas appliances, searching out all the new avenues and methods of increasing its business and finding new applications for its products, convincing the public by its earnest desire to acquire new business, of its equally earnest desire to give good enough service to hold the old converts, will produce better sales' showing and fatter dividends than the company relying for increased business solely of the dealer, who carries gas goods as a side line.

The fact that most gas companies have grown away from the idea that it is necessary to give appliances away or to conduct, at a loss, a department in which the most vigorous campaign methods of advertising and canvassing are used, is only an added reason for the thrifty gas manager not having to depend on the half-hearted and often misdirected efforts of uninterested dealers. The argument so frequently advanced for gas companies discontinuing the sale's department, that the coal merchant does not have to sell coal stoves to sell coal, is perhaps a good one, but we may yet see them reduced to this strait if the gas companies keep their appliance boys busy.

The consumer can hardly expect to receive the same service from a company employing only a force of meter readers and collectors as from a company having a competent force of appliance sales' people, repair men, adjusters and demonstrators, intelligent and well fitted to see that every installation is working at the highest degree of efficiency.

The methods by which a gas company may engage in the appliance business, for it is a separate business in itself, so as to most successfully promote gas sales, is open to much discussion. I believe in the organization of a self-supporting company, a district entity in the parent company, and not burdened with the cumbersome and expensive machinery of half a dozen departments. Sell all appliances on a regular commercial basis, at a good profit of from 30 to 40 per cent., doing away with all loan and dollar a month propositions, relying on salesmen of ability who are paid on a liberal commission basis. A few dollars may be added to the price of a range, and the consumer will scarcely note the difference, while with the increased profits the company can afford to pay commissions which will interest really first-class salesmen.

The introduction of gas into a household or into a factory is largely a matter of personal solicitation, and I believe $1,000 spent in sales' commissions is better spent than $5,000 in regular advertising schemes. It is through the employment of competent appliance sales' people that the great difference between the sales showing of a company doing a strictly gas appliance business and the hardware dealers' methods will be shown.

Actual cases illustrate arguments perhaps the best. A commercial gas man was impressed by the fact that coke at $13 per ton, and of uncertain supply, was being used as a fuel in the local soft metal industries. Why was this not a great competitive field for the use of cheap oil gas? Selecting a new galvanizing plant in course of construction, the young superintendent of which was keenly alive to any advantage to be gained by the introduction of modern methods, studied carefully the conditions to be faced in substituting gas for coke, with the result that he was given the opportunity to install a set of gas burners under a zinc kettle of 8 tons capacity, bricked up in the usual manner. Air blast was furnished from a positive blower, and the burners were of

the ..... type, 24 in number, with individual air and gas cocks. The exact figures resulting from this interesting test were lost in the late fire, but the fact that the melting of 8 tons of metal was made in 7½ hours' time as against 30 hours previously required with coke, that no burning of the metal resulted, and that there was a very considerable decrease in dross, owing to the fact that the zinc was protected from oxidization by passing the products of combustion over the surface, proving the great saving in time, labor and material. It was never claimed that the actual fuel bill for gas would be as low as the coke bill, but when it was shown that the comparatively slight increase was offset by the above advantages, in addition to solving the question of hauling ashes, and it being found no longer necessary to retain a night watchman to control a fire under such perfect regulation, the balance was largely in favor of gas. The monthly consumption of gas under this kettle above averaged over 200,000 feet. The actual sale of burners amounted to only a few dollars, and it was necessary to watch the experiment day and night for a time, and to convince the most skeptical person, the shop workman, of the soundness of a method that decreased labor. The question that arises is whether the ordinary merchant engaged in the sale of hardware and gas appliances, incidentally, could find it worth his while to introduce the many applications, showing such a small monetary return, but great gas sales.

Through constant soliciting, the use of cuts and circulars illustrating industrial installations, gas has been introduced into many of the local galvanizing, babbitt melting, and cornice shops. The use of small tempering, case-hardening and annealing furnaces in tool shops, and of gas forges and tire setting machines in blacksmith shops, also met with favor, but at the present time we have no large installations of this sort, as the shops were destroyed.

All these appliances were used in connection with positive blowers, and a man was detailed to give regular inspection and to see that every installation was kept at a high point of efficiency. Such installations will average from 100,000 to 1,000,000 feet a year, and while the gas must necessarily be figured at a sliding scale, the company is given no more trouble and expense than from the average household consumer. Industrial and restaurant and hotel installations are many and varied, and can be followed with great advantage.

Our salesmen have learned to tell the business man or manufacturer that, no matter what line he is engaged in, he can use gas to advantage, and that we will design special appliances for him. Since the fire our appliance company has fitted up nearly 100 restaurant and hotel kitchens for the use of gas solely as a fuel, making complete installations of ranges, separate broilers, baker's ovens, steam tables and warming closets. There are large sales with consequently large commissions, and our salesmen are very keen on following this line of work.

Solicitors and Salesmen.—The question of the best method of paying salesmen is one which has been answered in many forms in gas association meetings. Some managers suggest straight salaries, others a basis of combination salary and commission on appliances sales, while others believe in paying on a basis of gas consumption 6 cents per 1,000 cubic feet for all new business turned in. In Denver a district system was tried, each man being paid on the increase in consumption shown in his particular district. Any methods which will help to increase the salesmen's efforts are valuable, as the promotion of gas sales depends so largely on these salesmen.

In our appliance company we have districted the city to conform with our branch office district. Under this plan each district will have an appliance display in the branch gas office, and is being canvassed by 2 solicitors on a straight 10 per cent. commission. These commissions are made payable only after the salesman has made his collection in full, this arrangement obviating any tendency to make misrepresentation or to accept bad credits. These salesmen are given full protection in their territories, excepting in the matter of special lines, such as industrial appliances, radiation and large apartment house installations. On this work 3 general salesmen are placed.

Advertising.—While placing more faith in the results to be had from personal solicitation, it devolves upon all public service corporations to do a certain amount of newspaper advertising, and a consistently liberal advertising allowance pays in many ways. That a great deal of money can be spent foolishly in cards, pamphlets and circulars is also well established.

The rules that decide a successful newspaper gas advertisement are hard to define. An "ad" may be very catchy and fail of its purpose. I believe regular commercial rules should apply to gas company advertising—talk gas, quality and appliance prices. I believe in advertising prices always to effect appliance sales. Advertise your cheapest range and water heater, and leave it to your commission salesman to sell the most expensive. We advertise $13.50 gas ranges and water heaters, with the result of getting many inquiries. Our clever salesmen do the rest.

Eighty-five cent, 23-candle power gas is also a strong talking point, and we run a series of "ads." on gas thrift. It is a small point but "At your service" in quotation marks appears in all of our advertisements.

Demonstration.—We make a regular practice of sending a capable cooking demonstrator to each household shortly after we have installed a gas range. This lady, who is very capable and intelligent, gives full instructions in the use and adjustment of the range and generally prepares a full meal. She also reports defective installations and any causes for complaint. We are preparing for a series of lectures and public cooking demonstrations to be held twice a week during the month of October.

Bulletins.—For several months this Company published a monthly bulletin, attractively printed in 3 colors and full of cuts showing new and successful installations of industrial gas appliances, well planned electric illuminations and signs in the business district. This monthly edition of 50,000 copies was distributed by means of bulletin boxes in the gas offices, meter men and collectors. Most of the expense was defrayed through trade advertisers, who found it a successful medium.

Wagon Display.—Previous to the establishment of district gas offices, which have given us appliance display rooms in all sections of the city, a portable display house, which could be located on vacant street car transfer corners, proved a successful means of interesting many people using gas and current. The house, a shingled cottage, 12 by 20 feet, was placed on running gears, was brilliantly illuminated at night, and was filled with the latest and best gas and electric appliances in full operation, including instantaneous and automatic water heaters, ranges and electric heating appliances. The profit on the direct sale of appliances more than defrayed the operating expenses of the car and the salary of the demonstrator.

Salesmen's Club.—Our salesmen and solicitors have for a long time had an organization holding periodical meetings and giving occasional dinners at which talks are made by members and invited guests, who are usually appliance men and manufacturers or men qualified to talk on salesmanship. That these meetings are beneficial and interesting is shown by the regular attendance. The only thing to be said against the club is the name—"The Hot Air Club."

Appliance Department after the Fire.—A brief mention of the work done by the Appliance Company in supplying wrecked San Francisco with gas ranges after the resumption of gas service, May 11, 1906, may perhaps be of interest to Association members. This date found us with about 6 ranges of assorted models—the remains of our display stock in one of the branch offices. How we were besieged by hundreds of excited people, anxious to be able to discontinue their sidewalk kitchens and our strenuous efforts to "corral" every range to be had on the Coast and to hurry Eastern shipments, seem now only a bad dream. Our office equipment was a pine table and a scratch pad for a set of books. Our fitters wrestled with burned pipe and fittings and our salesmen with irate customers, whose money had been accepted on special models of ranges, delivery of which would frequently be delayed by freight tie-ups. The department manager had no bed of roses, and the only pleasing and satisfactory times were when the monthly sales' reports were made.

That all San Francisco will shortly be using gas is evidenced by our crowning single order of 5,000 gas ranges to be delivered to the Red Cross Relief Association for the refugee camps.

It is rather a blow to our pride as gas appliance salesmen that it should require a whole townful of broken chimneys to demonstrate the value of gas as a fuel, but as a result of this shake-up of obsolete methods and usages, San Franciscans have learned the value of this great labor-saving agent. Not only in the sale of gas ranges will this fact be attested, but also in the heating of the many new temporary and permanent buildings for which we are placing orders for carloads of gas radiators.

Discussion.

The Acting President—Gentlemen you have heard a very interesting paper. I should like to hear from Mr. Pearson on the subject.

Mr. Pearson—I think Mr. Hamilton's paper would hardly be applicable to the smaller districts. The Edison Electric Company has a number of small plants covering Southern California, and necessarily our methods vary with the local conditions. In some places we have turned the business over to the local dealers, as stated in the paper by Mr. Cline, and in other places we have found it absolutely necessary to handle the business ourselves, and along the lines of the paper just

read. We are pursuing a similar policy in competitive territory, and I believe that it is a pretty good policy to use if the company wants to acquire all the business in the territory. The appliance business should be pushed to the limit, solicitation should be taken up to the utmost, and your service should be advertised on all circulars and bills, and the trouble-man should always be on tap. I believe in the smaller towns, especially in California, where we are drifting very fast toward municipal ownership, that it is up to the corporations to push their business, and handle every branch of it, in order to increase the sales of gas, and to see that the best possible appliances are put in the houses.

Mr. Lowe—This paper is of particular value. I think it is the most comprehensive one I ever heard on the subject, and so move a vote of thanks to Mr. Hamilton.

Mr. Jones—In seconding that motion, I would like to say in justice to Mr. Hamilton, though it may not be generally known, of the splendid work he performed immediately after the earthquake. He was on tap the moment the earthquake took place, with the full knowledge that it was up to him to put gas stoves in San Francisco, and he personally took charge of it and went ahead, and the enormous business done following the earthquake is practically due to his hard work. To be sure, he had excellent help, and an efficient crew of men under him; but he had the fearlessness and the knowledge to go into that breach and give the people of San Francisco what they most needed. [Motion carried.]

Mr. Rix—I would like to add a little something to what has been said, that industrial gas and demonstrating are two of the important elements in Mr. Hamilton's paper. What is the matter with joining these two together? Now, I do not know where to go to see gas furnaces in operation or to get any practical experience on the subject. We are installing a small one, using about 200 feet per hour, for the purpose of case hardening steel. I had to take a chance in ordering it from the American Gas Furnace Company, not having any experience. I believe there is more economy in using gas than in building up a coal fire for case hardening steel, but it would strike me, inasmuch as San Francisco is to be rehabilitated in its mechanical interests, that a great many will take advantage of gas for fuel, and there should be some kind of an exhibition where a man could get ideas on the sort of a furnace to order.

The Acting President—The Pacific Gas Improvement Company undertook to in tall any kind of apparatus required. We were the first to install a coffee roaster using 150,000 to 200,000 feet of gas per month. This gas furnace was used for many years by the Company.

Mr. Britton—I think Mr. Hamilton could give you offhand a list of the large consumers we have of industrial gas.

Mr. Hamilton—We have quite a great many large consumers. The largest, I presume, are the fruit canneries, next are the restaurants and hotels around town, where we have been spending our hardest efforts since the fire.

Mr. Lowe—With what success did Mr. Hamilton meet in introducing gas for use as fuel in hotels?

Mr. Hamilton—There are not many large hotels in town now, but we have all of the restaurants using gas. We have gas for fuel in the Jefferson Hotel, and bakers' ovens in several other places, and we have regular restaurant ranges, broilers, etc., in the smaller restaurants.

Mr. Britton—As a sample of industrial gas, Mr. Grover might tell you of a line that we have just laid from Berkeley to Point Richmond for supplying under long contract gas for the can factory of the Standard Oil Company, in the face of the fact that they had their own oil there and could make their own gas, and yet we are under contract for 5 years to supply them gas for making their own cans.

Mr. Grover—I hardly know what to say in connection with the size of installation. Of course, most of my work has been with laying the line, but I have been through the can factory many times, and one of the things that they are going to use the gas for is melting the lead for soldering the cans together. They have large soldering tables along the entire sides of the building on the second floor, and the burners are placed the full length of the tables. In addition to this, they have machines for soldering the small tops on the cans after everything else is completed.

Mr. Britton—I have been told the Standard Oil people contemplate using in the plant, when it is finished, approximately 200,000 cubic feet of gas per day, and that inside of 6 months they would double that capacity, and that they confidently expect to take 500,000 cubic feet per day inside of one year. That is a good customer.

Routine Business.

Mr. Lowe—I regret very much indeed to say that we will scarcely have time to read the paper by the Editor of the Novelty Department, but it will be published in the proceedings. It is now after 5 o'clock and we will have to adjourn. The remarks also apply to the paper prepared by Mr. George P. Low, Historian, which will also be published in the proceedings. Before the adjournment I will make the appointments for editors as follows:

Appointments for Editors.

Experience—R. P. Valentine.
Novelty—G. H. Hollidge.
Wrinkle—George S. Colquhoun.
Historian—George P. Low.

The Secretary—Mr. J. S. Kaneen has made a donation to the Association of an original set of "King's Treatise on Coal Gas," one of the most valuable books in our library. It also may interest the members of the Association to know that the gavel of the Association was the only thing preserved of its effects. It happened to be in the safe in my office and was thus saved from the fire. It was the only thing belonging to the Association that was saved. It is particulary interesting in view of the fact that there is placed upon it the first badge ever made for the Association, which was put there by Mr. Jones.

Mr. Lowe—We will now hear the

Report of Committee on President's Address.

To the Officers and Members of the Pacific Coast Gas Association: Your Committee on the Address of the President begs to make the following report:

It is with a great deal of regret that we note the absence of our genial President, and the Committee feels that it would be fitting to send Mr. Martin a greeting from the Association, deploring his absence, and wish him a speedy and happy return to our beloved San Francisco.

The Committee wishes to report that the address, while short and to the point, is found to be full of good thoughts for the members of our Association. We call your attention to the paragraph in which he asks the Association's commendation for the members who took part in the rehabilitation of the different gas works after the late calamity. This praise or commendation should take some permanent form, so that future generations may know who the men were who shared in this work, and as far as possible, what the work was.

We think it proper to call attention to the paragraph in Mr. Martin's address referring to the small damage done by the earthquake, and feel that the Pacific Coast Gas Association should emphasize this for the benefit of the gas fraternity at large.

We trust that the members of the Association will pay heed to the invitation extended and the opportunity offered to visit the gas engine installation at Martin Station, a visit that your Committee feels will amply repay the time necessary for its consummation, and as transportation will be furnished by the California Gas and Electric Corporation, every member should avail himself of this opportunity.

We call particular attention to the paragraph in which Mr. Martin asks every member of the Association to have something to say in the meetings of the Association, and suggest following out this line of thought, and, if necessary to bring this about, the Chairman to call upon members who have not spoken for their opinion on questions that arise, to the end that the "rank and file" of our Association may, in accordance with the President's suggestion, assist in carrying on the meeting.

Your Committee again desires to state that we feel it is with a great deal of regret on Mr. Martin's part that he is unable to be with us, but not more so than the regret on the part of the members of the Association, individually and collectively.

We have for years been expecting, and have always found him at the meeting taking an active part, and when he finally became President over our deliberation he was compelled to forego the pleasure as a matter of personal sorrow to him, and regret and loss to us.

F. H. Eichbaum,
R. H. Sterling,
B. Pedersen,
} Committee.

On motion, duly seconded, the report was unanimously adopted. On motion, duly seconded, the men nominated to fill the offices of the Association for the ensuing year were unanimously elected.

The meeting then adjourned to reassemble at the banquet and at the outing to-morrow.

(To be Continued.)

[Communicated by "R."]

Defective Installation of Gas Arcs.

I am moved to write this article because I have seen so many imperfect installations of gas arcs in my recent travels. During the month I travelled through the Southern and Middle States, finally arriving in Cuba. I stopped over long enough in central points in the United States to observe conditions of installations of gas arcs for stores—the practice of putting up exterior gas arcs prevails to quite considerable extent through the southern cities and also in Cuba. I suppose one reason for this is the conditions of climate warrant a more extensive employment of outside installations of wires, lamps and apparatus. Nevertheless, very many stores and buildings are lighted outside by means of exterior lamps in American cities and towns. The aim of the exterior gas arc installation is to get a good light on the outside which will strike inside through a window. In recent years exterior and interior gas arc lights have been improved to such extent that they are known the world over as bright, white lights. The bright, white light excels in many ways for the storekeeper and the roof garden, for the dining room or the porch, and for many purposes where exterior and interior work is in progress. Night work on buildings, in quarries, on railways, etc., is being conducted with the gas arc with success. The notable outside, white light has proven quite a little bonanza to enterprising merchants who rely upon exterior advertising of window displays. If the outside gas arc is properly placed, the merchant not only lights his show window, but also the walk in front of his establishment.

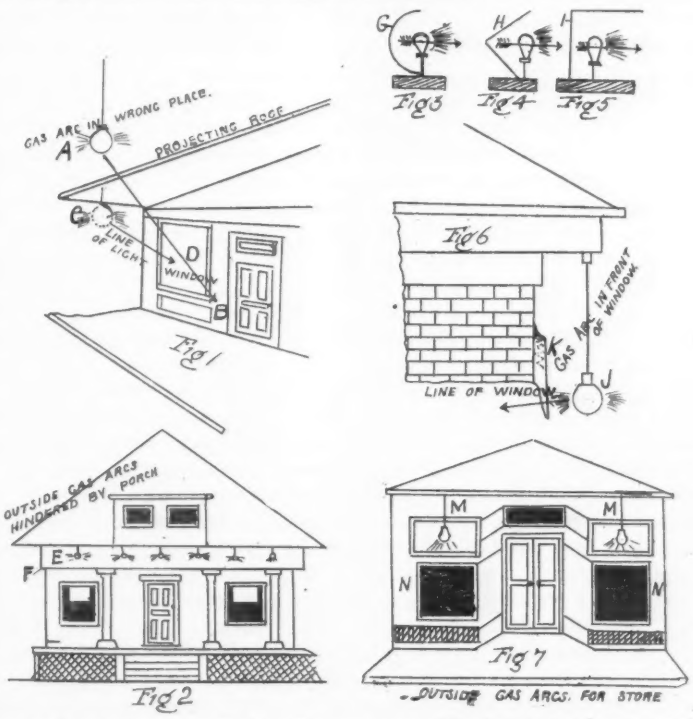
Of course there are disgruntled men who say they cannot or will not light up the city's street in front of their building; but these men are usually inclined to give in if you explain to them the benefits derived by having a brilliant light in front, so that attention is attracted to the store and means provided for persons in vehicles to stop and hitch up. Automobile parties will stop for lunch or to make purchases in front of well-lighted establishments, where they will avoid the dark fronts.

For years and years merchants actually packed the rims of show windows with electrical and other forms of lights. These lights would be strung along tin-covered apartments in the front of the window, below the level of tae window floor. A part of the light would shoot up and light the lower portions of the wares. The rest of the light remained hidden back of the tin. Many beautiful displays were worked out, but a far richer field developed when gas arcs became popular for this service. As before intimated, it is when your contractor installs the exterior gas arc lights incorrectly that you do not get proper service, then you are induced to condemn the system of lighting. I can explain what I mean with the cut in Fig. 1. It is the custom in many of the Southern cities and towns, likewise in Northern sections oftentimes, to use considerable porch work for the protection of the sidewalk traffic and to keep the sun off the goods in the windows. Sometimes the protection consists of canvas drop shades, and then again of regularly fitted wood and tinned roofed porches.

I found one case in which a first-class gas arc globe was hung to a wire, as at *A*, Fig. 1. The projecting porch was not taken into consideration by the workmen, therefore the roof extended forward over the sidewalk, forming a substantial shade to prevent the rays of the arc light getting into the place most desired; namely, the window full of goods on show. The light reached to the point *D* in good form. Here it was cut off by the roof. The storeman grumbled, as might be expected, for the front of his store was most liberally lighted, as was the street. Finally it was decided to drop the gas arc globe to the point *C*, a most simple operation, after which the window received the full benefit of the lamp and the proprietor thought there was nothing else like it.

In another case which I observed, an individual, who was inclined to have night parties, desired to use gas arc lamps for lighting the porch of his house, at the same time the lawns. Therefore, the row of gas arc lamps was installed along the line *E*, Fig. 2. But the architectural design of the porch was such that the line of the porch *F* prevented the light from striking in on the space below, and a shaded porch resulted, to the disappointment of the man; but, as in the case of the incorrectly installed light of the store, a prompt remedy was found by lowering the line of globes to a point where the light could strike direct into the porch.

It seems strange that these thing happen; but they do. I find that when electrical lights are put in the forms of shades of metal used are similar in construction to the plans in Figs. 3, 4 and 5. Fig. 3 shows the curved shade or reflector *G*, Fig. 4 the inclined, V-shaped style *H*, and Fig. 5 the box-form *I*. These reflecting devices are almost always made of bright sheet-metal, and in show windows are arranged along the lower edges of the windows, shielding the glare of the lights, and at the same time permitting enough light to enter the window to light up the display; but, calculate as you will, and you cannot get the full, bold and clear light desired by the proprietor of the store, for his fine decoration of window goods, that you can get by simply installing one or more exterior gas arcs directly in front of the window, high enough up to clear the line of vision and deflect the glare. You can hang the gas arc lamps to the cornice of the building, as at *J*, Fig. 6, opposite the upper part of the window, if the building is one story. The light will pass in the window in first-class shape. In case there is a second story window decoration you can go up a story higher. In modern times window decoration for the purpose of advertising goods is not confined to the first floor. Enterprising men go even to the third story with large goods which may be seen from the street and light the exterior of the window with supported gas arcs. I have seen fine displays of carriages in second and third floor show windows arranged like this. I saw a good second story show window containing an automobile lighted with an exterior gas arc, Fig. 7 is a diagram of a plan for the installation of



the single window store light with gas arcs. The lamps are hung as at *M*, *M*, by supporting to the porch underneath with proper wires. There is ample light sent downward to the windows, *N*, *N*, to completely light the interior display.

I am surprised to find so encouraging developments in gas arcs in these days of electrical lighting; but there are reasons, of course. The electrical current is somewhat expensive, and practical merchants consider expenses in these days. If they can get equal results at lower cost, they are pretty sure to adopt the cheapest, hence the interest in gas arc lights in the commercial world. Every time I strike off on a tour I find some mechanical idea working out for the more extensive use of gas. Something is always coming out which makes a better, cheaper and whiter light than before, using gas as the motive power.

Gas Supply Pressure: Old and New.

By Mr. Norton H. Humphrys, in *Journal of Gas Lighting.*

It is interesting and instructive to compare the modern views on the subject of gas supply pressure, as expressed in Mr. Grafton's paper and in the discussion thereon at the recent meeting of the London and Southern Junior Gas Association, with those that found general acceptance in the profession (say) 35 years ago. Gas has now been supplied to the public for nearly a century; and in the course of that time one might suppose that the best conditions in the interest of all parties concerned would have time to settle out. It is a vexed question that, like many others, has two sides. The consumer naturally clamors for the particular degree of pressure that happens to best fit in with his requirements at the passing moment. Perhaps next year he will have changed the conditions of his consumption, and be demanding something quite different. The gas manufacturers know that this question of supply pressure requires to be regarded from a very much wider

point of view, seeing that it is intimately connected with the reliability which has made for gas a foremost position in the ranks of various agents for the production of artificial light and heat; and, as a consequence, they are the subjects of occasional misrepresentation. At one time the gas engineer figures as a nervous individual, trembling at the bogey of the unaccounted-for gas item, and fearing to raise the supply pressure by a tenth or two lest he should unduly increase the undesirable percentage of loss; at another, he is supposed to be driving the meter indexes by some inexplicable manipulation of the pressure. It is almost needless to add that the consumer's views on this point are influenced by his personal surroundings and circumstances—such as altitude, distance from works, character of the consumption in his neighborhood, his own requirements, and especially the fittings on his own premises.

During the early days of gas supply, this question did not become prominent; but about the period above named, it was attracting considerable attention. Gas consumption was gradually emerging from the chrysalis of "lighting only" to the gorgeous and many-hued development, comprising all sorts of purposes, that it now occupies. The leading gas engineers were insisting on the importance of ample sized supply pipes, all the way from the holder to the burner, and moderate initial pressure. Newbigging's third Golden Rule—a more valuable axiom was never laid before the profession—was intelligently appreciated and applied. Some were disposed, like Mr. Grafton, to look upon a high pressure as the panacea for all gas consumers' ills; but the general trend was in the direction of moderate supply pressures. At the same time, attention was being directed, by the London Gas Referees and others, who might be regarded as representing the consumers, to the evils of excessive pressure.

A noticeable feature elicited during the proceedings at the Southern Junior Association, is that objections of the last-named class have almost entirely disappeared; and their effacement is coincident with the passing of the flat flame burner. For the sake of distinction, we may call the fishtail, batswing, argand and other arrangements in which the gas is not mixed with air previous to combustion, open burners; and the various kinds of the bunsen type, in which air is mixed with the gas before combustion, close burners. Under the old *regime*, 80 per cent. or more of the total quantity of gas used passed through open burners. These gave the best results at about 8-tenths pressure; and with any large increase, they became inefficient and extravagant. But with the continually increased introduction of Welsbach burners, gas cookers, fires, and engines, the proportion represented by the open burner tends to become smaller and beautifully less, until a class of users that formerly claimed to represent the whole, and were protected and legislated for as such, now promises to become practically extinct—at any rate, as a power in gas politics. The open burner users have in many districts diminished to an insignificant percentage, and no longer have any voice in the condition of gas supply. In their place, the close burner class make themselves heard. They want at least double the pressure required for the open burner; and there is this important difference, that the serious waste and deficient service caused by the use of excessive pressures with the open burner, does not apply to them. A high pressure, if not altogether economical, makes their lights brighter and their pots boil quicker, and is rather a convenience all round.

With the passing of the open burner, other changes have occurred—some of which are not less important. One of the chief points in view, when large mains and low pressures were so ably advocated, and with such success that the principle found general acceptance in the profession, was the minimizing of the variations of pressure on the consumers' premises. The difference between high and even pressure was not made sufficiently clear in the course of the proceedings under review. But in practice a wide variation, even if the minimum is not low, is more likely to cause dissatisfaction and complaint than a very moderate but even degree of pressure. One speaker mentioned a variation in supply pressure nearly approaching the ratio of 1:6; and while this is probably an extreme case, I think that variations of as much as 1:3 are not uncommon, particularly at the extremities of the district, farthest from the source of supply. One chief contributory cause is the variation in consumption from hour to hour, and a class that cannot be foreseen and provided for. When gas was used exclusively for lighting, the man in the governor house knew almost to a minute the time when the consumption would increase, and the rate of demand during the evening. With cookers and fires, it is possible—knowing the customs of the neighborhood, the temperature prevailing, and other conditions—to gauge the rate of consumption in a more limited degree. But with the wide variety of uses represented in an ordinary district to-day, there will, in addition to the regular variations that are met by "breakfast pressure," "dinner pressure," etc., be an appreciable amount of irregular variation from hour to hour, that cannot be foreseen and provided for, and that can only be met by the unsatisfactory expedient of excessive pressure. This question of the variation in pressure, due to variation in consumption, tends to become more acute, and will probably lead to the use of district governors or other regulators more extensively than in the past. It opens up the question of whether the regulator should be at the head of every street, at the outlet of every meter, or applied to every single burner. The nearer the burner, the more efficient the regulation.

It is no uncommon thing to find a district of several square miles supplied from one source, and that possibly at one corner, or on the outside of the area of supply. Under such circumstances, a considerable variation must obtain at the far end, however carefully the supply may be regulated from hour to hour. In any such district (leaving out of consideration the limited number of pressure regulating arrangements that are used by the consumers), there is only one point of adjustment, and that is at the governor. There the pressure will remain as set; but as we get farther and farther away, the available supply pressure will be the initial pressure less several variables—some of a regular, others of an irregular, character. Ignoring for the moment the question of altitude, there will be a fairly constant loss represented by the head necessary to overcome all sorts of convolutions and hindrances between the point of control and the burner—such as bends or baffles in the mains and service, the pressure required to work the meter, and to drive the gas from the meter to the burner. In addition, there will be a variation from *nil*, when no gas is being used elsewhere, up to a maximum when the consumption is in full swing. To put the point in another way, suppose we have two houses exactly alike and fitted with the same number of lights in each case—one having fairly large distributing pipes and supplied at a low but sufficient initial pressure, and the other small pipes but a high or excessive initial pressure. Put a pressure indicator on at a point farthest from the meter and note the variation as each successive light (from one up to the full complement) is brought into use. It will be found that the variation is less on the first named than on the second.

There is also a change of another character, the effect of which must not be overlooked. Comfort and saving of trouble in these modern days are at a premium, and cost at a discount. There is demand for increased efficiency, and less disposition to look at the cost. Complaints as to alleged high or excessive charges are much less prevalent than they used to be. There are no consumers' indignation meetings or protection societies in these days. Several contributory causes to this state of affairs may be instanced—such as the gradual reductions in the cost of gas, the repeated improvements in apparatus of all kinds (whether for lighing, cooking or warming), enabling a much larger duty or value to be obtained, and increased experience in regard to usage, which should lead to a similar result. But the chief factor is that the consumer of 1906 thinks more of his comfort and less of his pocket than did his predecessor of 1871.

This change from the open to the close burner, together with increased consumption, has necessitated an increase in the initial pressure; and the probability is that each reduction in price has been accompanied by a rise in supply pressure, and that the gauge at the outlet of the average gas works governor now stands at about double, during the lighting hours, as compared with some thirty years ago, and at more like threefold during the day. But on reading the views of some of our friends on this subject, one wonders where the demand for more pressure is going to stop. If 4 inches is an advantage, why not 5 or 6 or 8 inches? Where are we now, and where are we getting to? If such find general acceptance, then the passing of the open burner means radical changes that will affect the whole conditions of gas supply, economical and otherwise. At this time of the year especially, it is a comfort to the gas works manager, as he leaves the works in the evening, to glance at his well-filled holders, and know that the conditions of supply are as nearly automatic as is humanly possible, and that the maintenance of a proper output is not dependent on human or on mechanical agency. The weight of the holder at present furnishes the prime mover for the distribution, and though it might be increased by loading, there are limits to that procedure. Forty-tenths or more pressure at every burner means mechanical, in place of natural, distribution. The gasholder will become simply a storage reservoir, and that time honored and excellent servant, the gas works' governor, which has rendered such good service in its day and generation, must give place to a compressor, or "booster," or pressure increaser. Giving up the advantage of the natural pressure of the gasholder, in favor of artificial or me-

chanical pressure, dependent from minute to minute on the efficiency of the machinery and the attention of the engineer in charge, is not a matter to be lightly considered. It is letting gas supply down to the level of electricity. But 4 inches or more at the burner is unattainable by an ordinary gasholder; and gas engineers will require very cogent reasons to induce them to break down the stronghold afforded by natural pressure and to rely on artificial pressure.

Having cast off the established parliamentary regulations in the matter of pressure, which has been a dead-letter for years, the gas industry is in the position of a crab that has cast its old shell and is waiting for a new one to grow. What is or is not a proper pressure is entirely a matter of opinion. But the generally accepted idea in the profession is that 18-tenths to 20-tenths at the meter inlet is sufficient for all purposes. There is no objection to moderate increases of pressure. Experience has established the fact that they can be effected without prejudice to the item of unaccounted-for gas. The loss from this source tends to become less, not more—higher supply pressure notwithstanding. Many of the factors that go to make up the total of this mysterious quantity are independent of pressure, or only slightly related thereto. But when regarded in the light of business experience, Mr. Grafton's views on the subject of supply pressure are remarkable for a certain degree of crudity and looseness. If a 6-inch initial pressure at the meter can be satisfactorily dealt with by the main tap, it would appear that pressure regulation at the gas works is, from a consumer's point of view, a superfluity. Would Mr. Grafton suggest more attention to the main tap, in the case of the variation from 15-10th to 85-10ths, as mentioned in the discussion? The number of gas engineers who would undertake to give every customer a minimum of 40-10ths at the burners is almost on a par with those who would issue a standing order that cookers are to be connected up to the meter with ¾-inch pipe. History repeats itself to some extent. When piping was much more costly than it is at present, there was an undue leaning towards small pipes and excessive pressures.

All those gas engineers who have completed their half-century or so at the mill can remember some experiences on this line. But the day of small pipes, at least, is gone by, never to return. The problem of supply to-day is, how to give every customer an even, but not excessive, supply at all hours of the day and night, independent of the irregular variables above noticed. One means of producing this is the maintenance of a high pressure in the mains, coupled with the use of a reducer or step down transformer at the meter inlet, such as is used in connection with the supply of natural gas in America, where a roaring torrent of no one knows how many pounds per square inch, is reduced to the correct 20-tenths or 30-tenths. Such a system, combined with a fairly well arranged system of supply pipes, which would not include a ¾-inch pipe to the cooker, appears to fill the bill. Something might also be done in the way of variable governors, which, instead of giving a fixed outlet pressure under all conditions of consumption, would give a variable pressure, increasing with the rate of flow. Something of this kind is, I believe, used in America.

SPECIAL ENGLISH CORRESPONDENCE.

COMMUNICATED BY NORTON H. HUMPHRYS.

SALISBURY, ENGLAND, Nov. 10th, 1906.

The Junior Gas Associations.—Municipal Muddling.—Gas Displaces Electricity in Public Streets.

The Junior Associations have started their winter's work with a spirit which seems to indicate that they must be recognized as permanent institutions and as a power in the land. The magnitude of one industry, and the numerous branches of commerce or technical work that are included in it, leave room for almost an unlimited amount of Association work, and we wish them every success. One thing that may be noticed is that they begin their work *de novo* and with a perfect freedom from the shackles of traditions of the elders, which those who are drawing towards the sere and yellow leaf period of life find difficulty in throwing off. The Yorkshire Junior Association were fortunate in inducing Mr. Thomas Newbigging to give an address at the opening meeting, and that gentleman spoke in inimitable style a sterling, manly dissertation, the keynote of which was that his hearers should aspire to be something more than gas making or gas company machines, that they should be good men and good citizens of their day and generation. He gave a prominent place to sterling qualities of character, which are apt in these days to be taken for granted to such an extent that they are almost entirely ignored. There is no profession for which a healthy mind in a sound bedy is more necessary than the management of a gas works, and no amount of education will cover deficiencies in this respect. And it may be questioned whether modern conditions of middle-class life are conducive to this desirable end. Periods of excessive application to study, interlarded with unduly long vacation times, in which over-excitement, late hours and luxurious living are not absent, tend either towards an overdone specimen of muscular development, or to a condition of nervous and mental exhaustion combined with physical ill health. A young man may have no end of medals and certificates, but if he also has false teeth, a need of spectacles and a bad digestion, he will never cut much of a shine in the profession. Moderation and regularity in all things are the best rules. Steady and regular work, not compressed into 2 or 3 terms of 10 weeks each, but spread over about 300 days out of the 313 working days in the year. A sufficient but not excessive proportion of wholesome recreation and a proper appreciation and utilization of the Sabbath day. These I take to be some of the ideas that Mr. Newbigging wished to convey to his hearers.

The London and Southern District Junoir Association have been discussing modern conditions of gas supply, which have changed so much during recent years that the whole subject is worthy of exhaustive investigation. It is a difficult question to deal with, as our individual experiences as consumers are apt to be over-colored by local peculiarities and very likely by defects on our own premises. The whole thing comes down to complaints of insufficient or of variable pressures, which have been somewhat prominent of late, and these may have directed the attention of the London Association to the subject. The unfortunate part is that while the gas company is virtually held responsible up to the burner—if a man has a bad light he does not blame his gasfitter as a rule—their control absolutely ceases at the outlet of the meter. If they had proper powers of control, and were able to order the size of the pipes throughout, 95 per cent. of the deficient supply complaints would disappear. So long as gas is used for all sorts of purposes there will be the difficulty of variations in certain localities, due to erratic fluctuation in the rate of consumption. A 40-horse power engine, for example, that is started or stopped at all sorts of times as required, can not but cause a noticeable variation of supply in the immediate neighborhood. And the only practical remedy would appear to be a more extended use of pressure regulating appliances on the consumer's premises. The gas company can scarcely put a district governor at the end of every street, and while they can foresee and provide for regular fluctuations, such as those that follow the hours of light and darkness, the meal times and hours of commencing or leaving work, there remains a large proportion of uncertain and irregular variations that cannot be foreseen.

The Midland Junior Gas Association, with the recklessness that belongs to youth, arranged an outdoor excursion at this season of the year. Fortune favors the brave, and the weather, strange to say, was all that could be desired. The rendezvous was a new works being constructed at Coventry, on a site 40 acres in extent and three miles from the center of the district supplied. Here they were able to see a plant in process of erection equal to the production of 5,000,000 cubic feet of gas per day, of which about one-fourth will be carburetted water gas and storage for 3,500,000. Provision is left for extension as required, up to three times the present capacity. Sulphate of ammonia and sulphuric acid works have already been completed and are in operation. The Association met with a cordial and hospitable reception from the engineer, Mr. Fletcher W. Stevenson, and his assistants, and had both an instructive and enjoyable time.

The Manchester Junior Association were able to combine a visit to a gas works with the exploration of a coal mine. They first visited a pit belonging to the Astley & Tyldsley Coal Company, and then proceeded to inspect a modern gas works belonging to the Tyldsley Urban District Council, and capable of making 250,000 cubic feet of gas per day, with provision for extension up to 1,000,000. Such an excellent programme secured a record attendance, and no wonder. The proceedings also included a business meeting with a suggestive and helpful address from the president, and after that a smoking concert. This represents a heavy day's work, and it is not likely that any member found the time hang on his hands. On the same day, the Scottish Junior Association visited the Dundee Corporation Gas Works, which have recently been reconstructed on modern lines. And here we must leave the Juniors and their doings, with every wish that their shadows may never grow less, and that the energy and ability that have marked their opening arrangements may be maintained for many years to come.

The municipal elections are held at this season of the year, and as a rule matters relating to gas are not concerned with them. In several towns there have been complaints as to the loss on municipal electricity supply undertakings. But at Nottingham the gas question has helped very largely, and in a manner that illustrates the desirability of muni-

cipal authorities confining themselves to their own proper sphere, and not embarking upon trade or competition with private enterprise. So long as the gas is in the control of a trading company, the municipal authority, as representing the consumers, can exercise a wholesome control. But directly the concern becomes the property of the local authority this direct and beneficial representation of the consumer entirely ceases, and the last state is worse than the first. Political and personal differences crop up, and, like weeds amongst wholesome grain, sometimes assume such proportions that the useful growth is hindered and smothered. The permanent officials and staff, who after all are really responsible for the conducting of operation and earning of profits, are disturbed and distracted by personalities and other matters entirely out of the sphere of their proper programme, and by the actions of obstreporous members who are thinking more about opposition to the other camp, or the advancement of their own party, than of the interests of the undertakings or of the consumers. The manager of a gas undertaking cannot possibly do his work better for being harassed by threats of dismissal. And the probability is that while the gas committee are disputing one against the other, important matters that require immediate attention are laying in abeyance. At Nottingham coal is cheap and business is good, and therefore the officials are able to keep the thing fairly straight, notwithstanding the difficulties created by the gas committee, who profess to control its affairs; but a well directed company would do better for all parties concerned. Unless a more reasonable spirit can be brought to bear than has been in evidence for some few years, the outlook for the gas consumers, and for the corporation as owners of the undertaking, is anything but satisfactory or promising. No body of shareholders would allow such a wretched state of affairs.

It is now generally recognized that electricity cannot compete with gas, either in respect to cost or efficiency, for public lighting. The deficient diffusive power, which is common to both arc and glow lamps, necesitates a very excessive candle power, as compared with incandescent gas. A strong plank in the platform of municipal electric light enterprise has been the securing of the street lighting on terms that are not too closely investigated; but in spite of arguments about helping the rates and dealing in their own shop, the ratepayers in many towns have insisted on gas-lighted streets, even where the gas belongs to a private company and the electric lighting to the municipality. This feeling was particularly evident at a recent meeting of the Court of Common Council of the City of London, when a report by the Streets' Committee was presented, showing that the result of replacing electric light by incandescent gas in three streets only, Fleet street, Queen Victoria street and Monument street, was a saving of £194 in first cost, and of £490 per annum. As a consequence, some alterations in the way of displacing other existing arc lamps were proposed. The recommendation was criticized by gentlemen who were favorable to electricity or to the electricity companies, but no attempt was made to disprove the above figures, or the statement by the chairman of the committee that the incandescent gas light was a great success. An attempt was made to get the matter referred back to committee, evidently with a view to giving electricity another chance by allowing the electric companies to make further proposals. These, by the way, are the usual tactics adopted in connection with public lighting questions. Knowing that their chances are poor, the electricians prefer to see the gas company tied down to a firm tender, and then to get the matter adjourned, and to present their own tender after having had ample time and opportunity to investigate the terms with which they have to compete. In some cases they had thought it worth while to cut below actual cost, for the sake of the advertisement. On this occasion these tactics were not successful. Only two or three voted in favor of the amendment and the original motion was carried.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

MR. GEORGE F. HOWLAND, Secretary of the Worcester County (Mass.) Gas Company, writing under date of the 24th inst., says: "It is the pleasure of the Worcester County Gas Company to announce the fact that last night it completed its high pressure system from Worcester to Palmer, Mass., embracing 10 towns, having a total length of main line of 40 miles, exclusive of branches. The town of Palmer was lighted last night with gas for the first time in its history amidst the enthusiastic comments of its inhabitants. The pressure carried on this line has a maximum of 35 pounds to the square inch. During the progress of the work the Worcester County Gas Company has been stepping from town to town, lighting each town as reached, without the slightest hiich of any description occurring in the operation of the system, never once failing to supply gas since it was turned on to the mains. The engineering work has been under the personal direction of Mr. Alfred Clarke, who is President of the Company. Mr. Clarke made a careful study of all the high pressure systems, for natural and illuminating gas, from the Atlantic to the Pacific, before commencing on this extensive piece of work, gathering all the information possible on the subject. This is the third high pressure system that Mr. Clarke has constructed. It contains several new and advanced ideas relative to the materials used for underground work of this nature; also in the auxiliary apparatus and fittings. All fittings of every description have been separately tested before being placed in position, and all mains before being covered have been tested to a pressure of 90 pounds to the square inch, and kept under this high pressure for several hours. The Worcester County Gas Company, in addition to its gas franchise, has an electric light franchise covering the whole territory through which it passes. The work for the Company has been done by the Light, Heat and Power Corporation (gas and electric contractors), of Boston, of which Mr. Alfred Clarke is Vice-President and General Manager. The Worcester County Gas Company is one of the subsidiary Companies of the Massachusetts Lighting Companies, of Boston, that operate in about 20 towns in Massachusetts, with both gas and electricity."

THE Cumb.rland (Md.) Gas Light Company has informed the residents of that city that, beginning with gas consumed from the 1st inst., the gross rate will be $1.10 per 1,000 cubic feet, irrespective of the use to which the gas is put. Prompt payment (within 10 days of rendering of bills) and a discount of 10 cents per 1,000 becomes operative. Quoting from the circular detailing the reduction: "This Company was organized in 1854, and for 52 years has faithfully supplied its customers in the city of Cumberland with gas. Its past history proves that its promises and product can be relied upon. We have never raised the price of our product, though a few years ago we were fully justified in doing so by reason of the abnormally high price of all the materials we had to purchase; but on the contrary have voluntarily reduced the price of gas 5 times within the life of the Company. In view of these facts, and the further fact that ours is a home industry, paying a large amount of taxes for the support of the State, county and city government, we ask for the continued support of the citizens of Cumberland."

THE preliminary matters in connection with the establishing at Lititz, Pa., of the Lititz, Manheim and Ephrata Gas Company, have been completed. A site has been purchased at Lititz, and building operations will be commenced on or before December 15th. We here repeat the list of officers: Prssident, George L. Hepp; Vice-President, James C. Keene; Henry R. Gribbel, Secretary and Treasurer. The officers may be addressed at Lititz.

THE Springfield (Mass.) *Sunday Union*, of November 18th, contains a lengthy and interesting article respecting the nature and growth of the municipal gas and electric lighting plants of Holyoke. In it we are pleased to note a very handsome tribute to the cleverness with which Mr. William H. Snow, the Superintendent of the plants, is conducting their operations.

HERE is a new scheme for the "advertising managers" of gas companies to ponder over—it was inaugurated by the Coldwater (Mich.) Company—the particulars respecting which are detailed in the following circular: "Between the Southern Michigan Hotel and Clay Street, on the north side of Chicago street, and between Columbus and Lockwood and the Fair, on the south side of Chicago street, there are 73 corporations, firms or individuals doing business on the ground floors of buildings fronting and numbered on Chicago street. How many of them use gas? For the first correct answer by a pupil in attendance regularly at the public schools a reward of $5 will be paid at the gas office. Remember that there may be two or more tenants in the store, and also that names are not to be given; simply, how many of the 73 are gas consumers. Write the number which your investigations lead you to believe is the correct one, together with your name and address, on a sheet of paper, inclose same in an envelope, and bring or mail it to the gas office. Contest will close at 8 P.M., * * *, and in case a correct answer is not received, the first answer which is nearest correct will be awarded the $5. Children of the Gas Company's employees are barred from the contest." There is originality, if nothing else!

THE proprietors of the Citizens Light, Heat and Power Company, of Auburn, N. Y., have purchased the plant of the old Auburn (N. Y.)

Gas Company, located on Water street in that city. It is proposed to construct an electric lighting plant thereon.

MR. W. B. TUTTLE'S temporary appointment as Vice-President and General Manager of the San Antonio (Tex.) Gas, Electric and Traction Company, has been formally ratified by the Directors. May the best of good luck attend him.

A CORRESPONDENT in Worcester, Mass., forwards the following under date of the 23d ult.: "Mr. Andrew J. Smith has lost his suit against the Worcester Gas Light Company, for the 'conscious suffering' of his daughter, Christina Smith, according to a decree recently handed down by Judge Lawton of the Superior Court, who found for the defendant. The case, which was heard at a jury-waived session last week, was one for suffering which it was alleged was caused by a leakage of gas in the cellar of the house in which deceased lived. Plaintiff claimed that his daughter, after an operation at St. Vincent's Hospital, was brought home and was expected to recover, but that gases leaking from pipes around the residence caused her to breathe with difficulty. Medical testimony was offered to show that the deceased suffered from headaches and nausea on account of breathing gas fumes. The Company claimed that it did everything possible to stop the leaks and finally succeeded after having dug several holes around the Smith residence."

AT the annual meeting of the shareholders of the Buffalo (N. Y.) Gas Company the Directors chosen were: A. C. Humphreys, W. W. Randolph, Henry Seligman and Stephen Peabody, of New York; Robert L. Fryer, Emile Gillandeau, H. D. Locke and W. S. Riselay, of Buffalo; Robert C. Pruyn, of Albany, N. Y.; F. B. Bracken, of Philadelphia, and Howard L. Clark, of Providence, R. I.

THE scheme for putting in a gas works at Havana, Ills., is surely a go. The necessary two-thirds consent has been obtained, and the capitalization of the Company has been put at $30,000. Mr. Robert Kirke is now in charge of the affairs of the concern.

A CORRESPONDENT in Lowell, Mass, writing under date of the 24th ult., incloses the following: "On November 19th Wm. H. Forbes, machinist, was fatally burned in the retort house of the Lowell Gas Light Company by an instantaneous *flash* of coal dust. This fine dust had accumulated in the channel of an I-beam lying on its side, at the top of a coal pocket, about 70 feet above the ground. This was seen to be burning slowly and a workman attempted to sweep it off with a push broom. This caused an explosion of the dust and the laborer escaped by jumping into the coal pocket. Forbes, who was standing nearby, was so badly burned that he died in the hospital 5 hours later. The morals seem to be: 'Don't let coal dust accumulate;' and 'Don't stir it up when it is burning.'"

MR. J. A. MAYERS, representing in this city The Gas Machinery Company, of Cleveland, O., informs us that the Queens Borough Gas and Electric Company, of Far Rockaway, L. I., has awarded to the Cleveland folks a contract for the construction of a second, round steel purifier set, erected outside, and not to be housed. The contract also includes a coal handling hopper and elevator arrangement for the water gas plant.

ARTICLES amending the incorporation papers of the Johnston City (Ills.) Electric Light and Water Works Company have been filed. Under them the title has been changed to the Johnston City Electric, Gas and Water Works Company. The capital has been increased to $70,000, and the number of directors from 3 to 5.

"BILLERICA, MASS., has gotten to the point where it is anxious for a gas plant;" so writes Mr. L. R. Adams, who adds: "The sister town of Tewksbury enjoys an all-night service from gas lamps at a cost of about two-thirds what Billerica pays for electric lighting until midnight."

A QUAINT set of resolutions to read in these active days is the set adopted the 20th ult., at a special Town Meeting of the Towners of Cottage City, Mass.:

"*Voted*, That a Committee, consisting of David J. Barney, Clofus L. Gonyon, L. Gonyon and the three Selectmen, be instructed to contract with the Cottage City Gas and Electric Light Company for lighting the town for a term of years, not exceeding 5.

"*Voted*, That the Committee be instructed to arrange if possible with the Cottage City Gas and Electric Company that, in case of fire after lighting hours, to turn on the lights.

"*Voted*, That the Committee be instructed not to exceed the sum of $3,500 per annum for the contract price."

THE old-time, quaint town of Milford, Conn., which for well on to 2 centuries has calmly nestled near Long Island Sound, midway o Bridgeport and New Haven, has quite tired of having electric light exclusively. It wants gas, and that longing has undoubtedly been fostered through the success which has attended the laying-on of gas in the adjoining borough of Woodmont, at the instance of the New Haven Gas Light Company. In fact, Milfordites declare that if New Haven will not pipe to them they will build a gas house and piping system of their own.

THE residents of Weymouth, Mass., are anxious that the Quincy Gas Company shall extend its main system to and through their district.

THE Albany (N. Y.) *Journal* says that the New York Central Railroad Company has adopted a new gas mantle for use on the cars, and they are now being installed on all cars turned out of the shops. An Instruction Car, in charge of Assistant Engineer Roy H. Harvey, was in the Union station yard at Albany some days ago, and the employees were taught how to place and maintain the new mantle. The incandescent mantles for burning Pintsch gas, with which a number of cars are already equipped, have been proven in service to be eminently satisfactory and their use is being rapidly extended. The reason for the adoption of these lamps, of course, is on account of their vastly improved service over the preceding type. The Instruction Car will stop at all the important station yards of the Company.

SENATOR KEAN and his associates are to be congratulated over their notification to the residents that, beginning January 1, 1907, the net selling rate is to rule at $1 per 1,000 cubic feet, in and about the districts supplied by the Elizabethtown Gas Company, of Elizabeth, N. J.

THE Milwaukee (Wis.) Coke and Gas Company has arranged for the construction of a huge coke storage house on its plant at the foot of Greenfield avenue.

THE new storage holder at South Haven, Mich., is well underway. It will be finished by the last of January.

Gas Logic recently had this to say respecting matter that was of great moment then and which is vividly remembered now: "Few householders who were buying coal during the great strike of 1902 will ever forget that emergency. It was, indeed, a time to try men's souls—when no one knew whether the price of coal would become prohibitive the next week or the next month. People were trying all sorts of experiments with fuel—bricks soaked in oil, compressed peat and things which had never been used for fuel before. The coal men did their best to husband the resources of the city, but as time went on they began to talk of refusing to sell to theaters and other places of amusement, and of doling out the remaining supply in such proportions as to meet the need of all who would actually suffer without coal, and let the loss fall on people who could stand it. It seemed as if the population were about to be ranged in two camps, the strikers and the struck, the struck being, as usual, the consumer. In the memories of New York gas men there is an interesting little chapter of unwritten history which has to do with that strike. It never even happened to get into the newspapers, and no one suspected at the time how near the great city was to one of the most terrible crises it has ever known. At the time of the settlement of the strike there was less than 2 weeks' supply of coal in the possession of the gas company, and no more coal in sight. Two weeks more and it would have been exhausted. Four million people would have found themselves facing an unusually severe winter without an adequate supply of coal, without gas and with the price of oil and the price of oil stoves both higher than in ordinary times. What is more, the order went out to close all sales departments where ranges and gas appliances were sold as soon as the strike assumed a threatening aspect. The men in control of the gas plant realized that if the people who had money to spare rushed to purchase ranges and heaters of all kinds, and used gas altogether in their houses, there might not be a sufficient supply to see the city through the strike, and that every resource of the company must be carefully guarded against a possible period of actual famine. That this care was justified is shown by the fact above stated—that even with every possible precaution the available supply of coal would have been made to last only two weeks."

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MONDAY, DECEMBER 3, 1906.

The Market for Gas Securities.

Dullness of the most pronounced sort ruled the market for city gas shares last week. Consolidated opened to-day (Friday) at 137½ to 138½, and no cash stock was in sight City gas bonds continue fairly firm as to the later issues, those of the earlier dates not being offered, save in case of forced sales.

Brooklyn Union is lifeless, with 15 points between the estimates of buyers and sellers. The stock looks cheap to us at the asking price of 120. Peoples, of Chicago, is 92 bid. It certainly is going higher, and before long at that. U. G. I. Company's shares are holding well to the recent sharp rise therein.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

16 WALL STREET, NEW YORK CITY.

DECEMBER 3.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$73,177,000	100	137¼	138⅛
Central Union Gas Co.—				
1st 5's, due 1972, J. & J.	3,000,000	1,000	101	104
Equitable Gas Light Co.—				
Con. 5's, due 1932, M. & S.	1,000,000	1,000	..	105
Mutual	3,500,000	100	190	235
New Amsterdam Gas Co.—				
1st Con. 5's, due 1948, J. & J.	11,000,000	1,000	95¼	0
New York & Richmond Gas Co. (Staten Island)	1,500,000	100	37	43
1st Mtg. Gold Bds. 5 p.ct.	1,000,000	..	98	104
Northern Union—				
1st 5's, due 1927, J. & J.	1,250,000	1,000	101	103
New York and East River—				
1st 5's, due 1944, J. & J.	3,500,000	1,000	108	111
Con 5's, due 1945, J. & J.	1,500,000	..	104	110
Standard	5,000,000	100	140	160
Preferred	5,000,000	100	155	175
1st Mtg 5's, due 1930, M. & N	1,500,000	1,000	104	108
The Brooklyn Union	15,000,000	1,000	105	120
1st Con. 5's, due 1948, M. & N	15,000,000		107	..
Yonkers	299,650	500	130	..
Out-of-Town Companies.				
Bay State	50,000,000	50	5/16	¾
" Income Bonds	2,000,000	1,000	..	75
Binghamton Gas Works	450,000	100	..	65
" 1st Mtg. 5's	509,000	1,000	95	100
Boston United Gas Co.—				
1st Series S. F. Trust	7,000,000	1,000	82	85
2d " " "	3,000,000	1,000	47½	50
Buffalo City Gas Co.	5,500,000	100	9	10
" " Bonds, 5's	5,250,000	1,000	75	80
Capital, Sacramento	500,000	50	..	35
Bonds (6's)	150,000	1,000	..	..
Chicago Gas Co. Guarantee 1 Gold Bonds	7,650,000	1,000	104	106¾
Cincinnati Gas and Electric Co.	29,500,000	100	100	100¼
Columbus (O.) Gas Co., 1st Mortgage Bonds	1,500,000	1,000	90	..
Columbus (O.) Gas Lt. & Heating Co.	1,682,750	100	..	95
Preferred	3,096,500	100	107½	108
Consumers, Toronto	2,000,000	50	200	204
Consolidated, Baltimore	11,000,000	100	..	90
Mortgage, 6's	3,500,000	..	..	118
Chesapeake, 1st 6's	1,000,000	..	..	..
Equitable, 1st 6's	910,000	..	..	..
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Consolidated Gas Co. of N. J.	1,000,000	100	15	17
Con. Mtg. 5's	880,000	1,000	92	95
Bonds	75,000	..	..	100
Detroit City Gas Co.	5,000,000	50	..	50
" Prior Lien 5's	4,618,000	1,000	..	98
Detroit Gas Co., 5's	381,000	1,000	75	80
" Inc. 5's	16,000	100	98½	100
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Essex and Hudson Gas Co.	6,500,000	..	39	40
Fort Wayne	2,000,000	..	..	..
" Bonds	2,000,000	..	55	..
Grand Rapids Gas Lt. Co. 1st Mtg. 5's	1,225,000	1,000	104½	105
Hartford	750,000	25	190	200
Hudson County Gas Co., of New Jersey	10,500,000	..	110	112
" Bonds, 5's	10,500,000	..	107½	108¼
Indianapolis	2,000,000	..	60	70
" Bonds, 5's	2,650,000	..	104½	105
Jackson Gas Co.	250,000	50	82	..
" 1st Mtg. 5's	290,000	1,000	97	100
Kansas City Gas Light Co., of Missouri	5,000,000	100	..	36
Bonds, 1st 5's	3,822,000	1,000	102	104
Laclede, St. Louis	10,000,000	100	.	105
Preferred	2,500,000	100	95	110
Bonds	10,000,000	1,000	104	104¼
Lafayette Gas Co., Ind.	1,000,000	100	..	60
Bonds	1,000,000	1,000	60	65
Louisville	4,570,000	50	143	145
Madison Gas & Elec. Co.				
" 1st Mtg. 6's	350,000	1,000	106	108¾
" 6 per cent. scrip, due 1910	100,000	25	85	87
Massachusetts Gas Companies of Boston	25,000,000	100	58¼	59
Preferred	25,000,000	100	85½	86
Montreal, Canada	2,000,000	100	218	218¾
Nashville Gas Lt. Co.	1,000,000	100	110	..
Newark, N. J., Con. Gas Co.	6,000,000	..	56	58
Bonds, 6's	6,000,000	..	137	138
New Haven	2,000,000	25	200	..
Peoples G. L. & Coke Co., of Chicago	25,000,000	100	92	92¼
Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage	20,100,000	1,000	..	..
2d "	2,500,000	1,000	104	..
Rochester Gas & Elec. Co.	2,150,000	50	88	..
Preferred	2,150,000	50	118	..
Consolidated 5's	2,000,000	..	104½	105¼
San Francisco, Cal.	15,800,000	100	..	..
St. Joseph Gas Co. 1st Mtg. 5's	751,000	1,000	92	..
St. Paul Gas Light Co	1,500,000	100	45	47
1st Mortgage 6's	650,000	1,000	113	116
Extension, 6's	600,000	1,000	112½	115
General Mortgage, 5's	2,465,000	1,000	96¼	..
Syracuse, N. Y.	1,975,000	100	50	55
Bonds	2,047 000	1,000	102	..
Washington, D. C	2,500,000	20	293¾	295
First mortgage 6's	600,000	..	.	
Western, Milwaukee	4,000,000	..	..	..
Wilmington, Del.	600.000	50	230	..

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DIVIDEND NOTICE.

OFFICE OF THE AMERICAN GAS COMPANY,
222 S. THIRD ST., Philadelphia, Pa., Nov. 21, 1906.

The Board of Directors of The American Gas Company has this day declared a semi-annual dividend of 3 per cent., or $3 per share, on the capital stock of the Company, payable on Dec. 1st, 1906, to stockholders of record on Nov. 23d, 1906, at 3 P.M. Transfer books close Nov. 23d and re-open Dec. 3d, 1906. Checks will be mailed.

1642-2 WALTER GODLEY, Treasurer.

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As Manager of a Gas and Electric Light Plant,

By a man who has successfully operated a combined gas and electric light plant, who thoroughly understands the manufacture of coal and water gas, its distribution under high and low pressures, and who is an up-to-date manager.

Address, "S. C. A.,"
1641-4 Care this Journal.

Wanted, Position

As Manager or Superintendent of Plant,

By practical man who has had experience in all branches of the business and competent to assume entire management of property.

Address, "J. S.,"
1640-4 Care this Journal.

Position Wanted.

A Capable Manager and Superintendent,

Now employed, desires a position as manager or superintendent of gas, or combined gas and electric plants, in city of 15,000 to 25,000 population. Successful record. Southern or Middle States location preferred.

Address, "P. T. A.,"
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By a young gas man, sober and industrious, with 11 years' practical experience with water and coal gas manufacturing. Has been employed in one of the largest and one of the smallest plants in the States, and has made good in every particular.

1642-2 Address "M. T.," care this Journal.

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Young man of good address and with practical experience in handling gas ranges and gas appliances, to handle the appliance and sales department of a growing company. Excellent opportunity for an energetic young man.

1642-2 Address, "GAS APPLIANCE," care this Journal.

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EXPERIENCED GAS SOLICITORS,

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"S. A. G.,"
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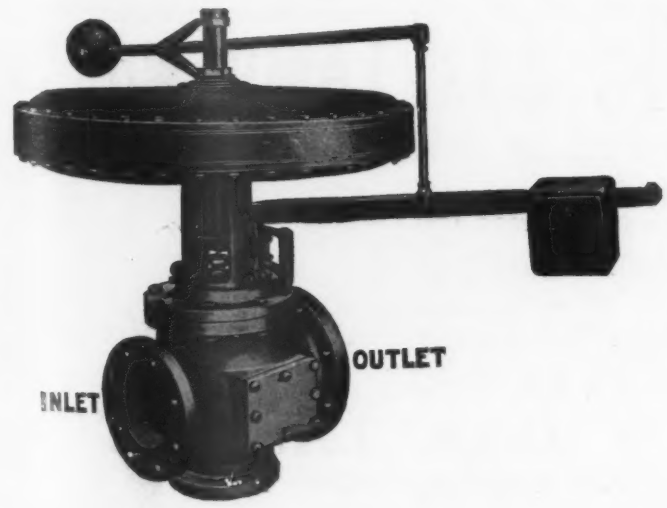

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FOR THE

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The above illustration was made from a photograph taken at the Manchester works of our English company on the day (Aug. 11) this meter was shipped.

This ***Four Million*** foot Rotary Meter is about to be installed at the 21st Street station of the Consolidated Gas Company in the City of New York.

One-half the Cost—One-tenth the Space.

When in Need of Station Meters

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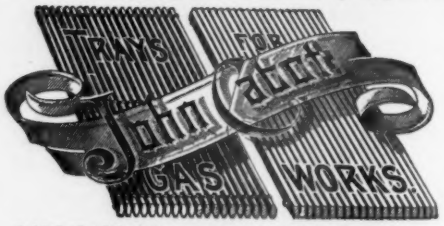

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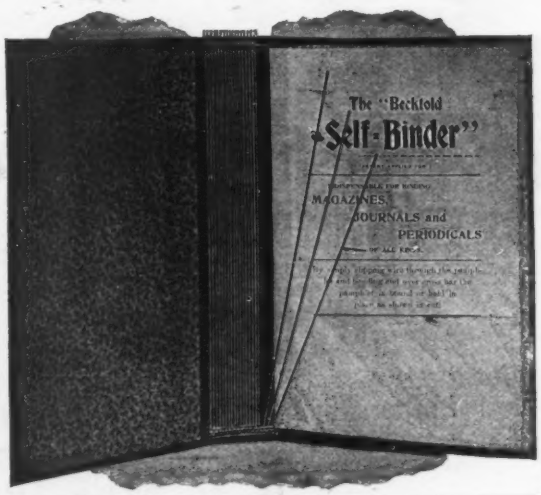

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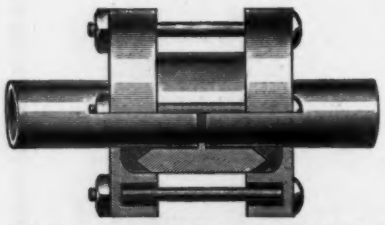
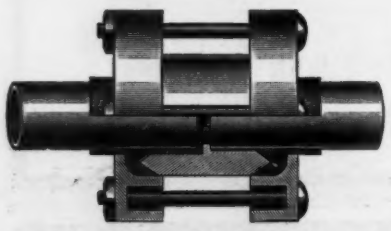
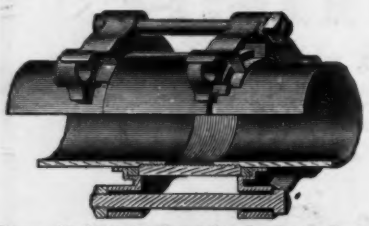

Regular Coupling, Style 1, for Plain End Wrought Iron Pipe.


Insulating Coupling, Style 5, for Plain End Wrought Iron Pipe.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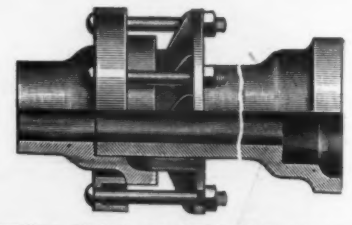
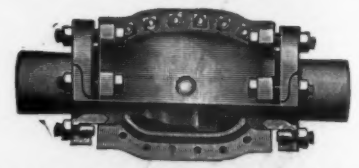
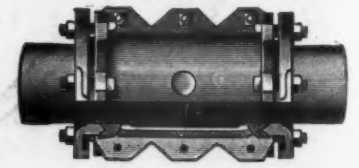
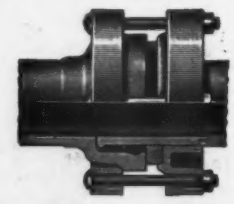

Coupling, Style 9, for Special Style Cast Iron Pipe.


Split Sleeve for Repairing Broken Bell on Cast Iron Pipe.


Split Sleeve for Repairing Broken or Cracked Cast Iron Pipe.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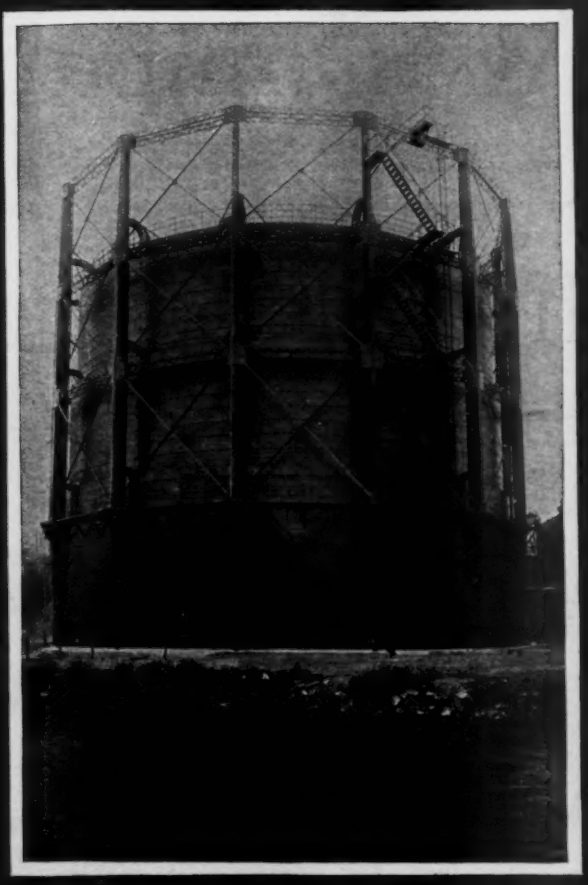

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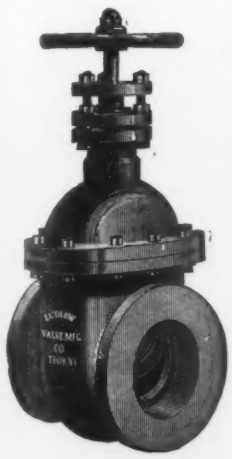

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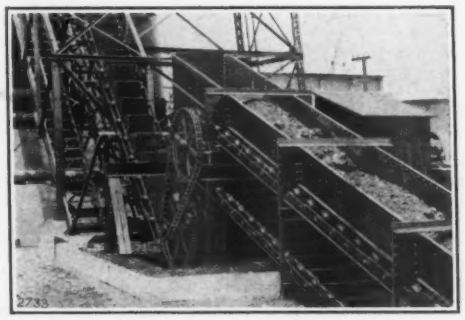

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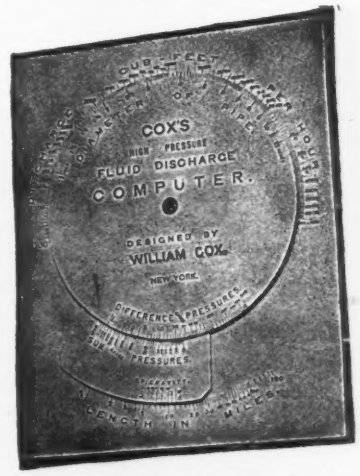

This Computer solves the following formula, which is applicable to Gas, Air and other elastic fluids, flowing through long pipes with high initial pressures:

Discharge in cubic feet per hour at atmospheric pressure $= 33.3 \sqrt{\frac{d^5 \times (p_1^2 - p_2^2)}{L \times w}}$

Where

d = diameter of pipe in inches,
p_1 = absolute initial pressure in pounds per square inch,
p_2 = absolute terminal pressure in pounds per square inch,
L = length of pipe in miles,
w = specific gravity of the fluid when air = 1.

To Find the Discharge from a Pipe and the Required Size of Pipe.

(1.) Set the specific gravity of the fluid opposite the length of pipe;

(2.) Bring the DIFFERENCE of the initial and terminal gauge pressures opposite the SUM of the initial and terminal gauge pressures;

(3.) Opposite any diameter of pipe will now be found the discharge in cubic feet per hour at atmospheric pressure; and

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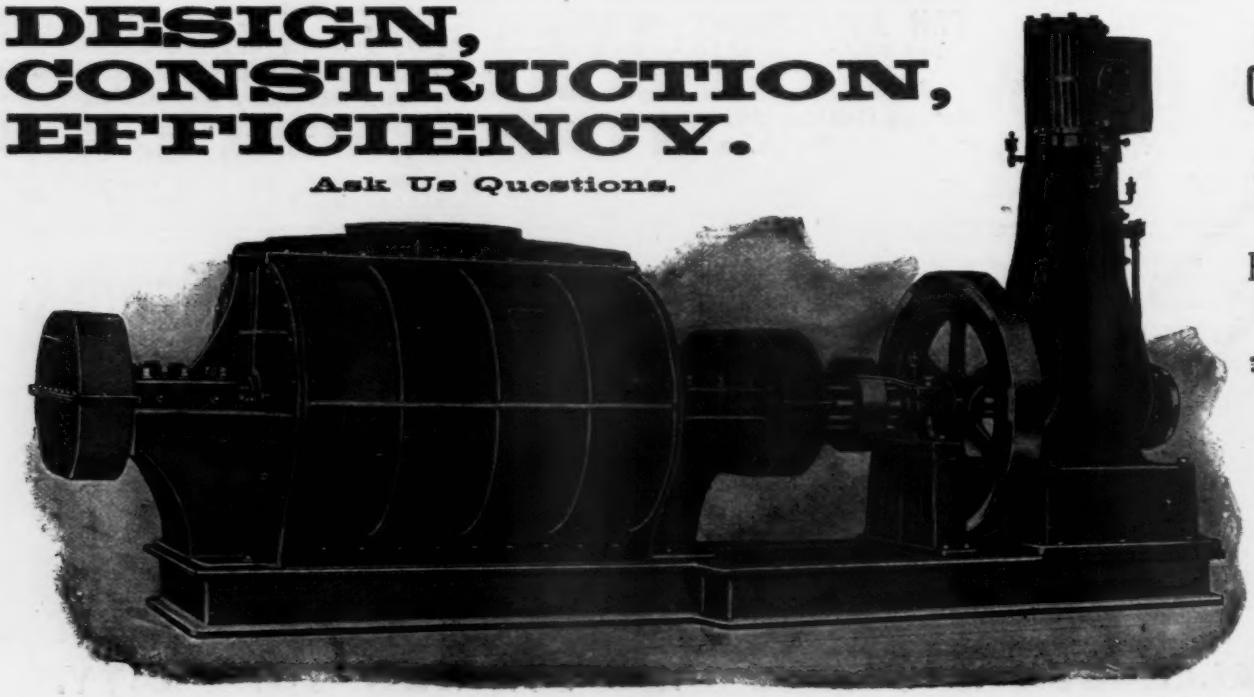

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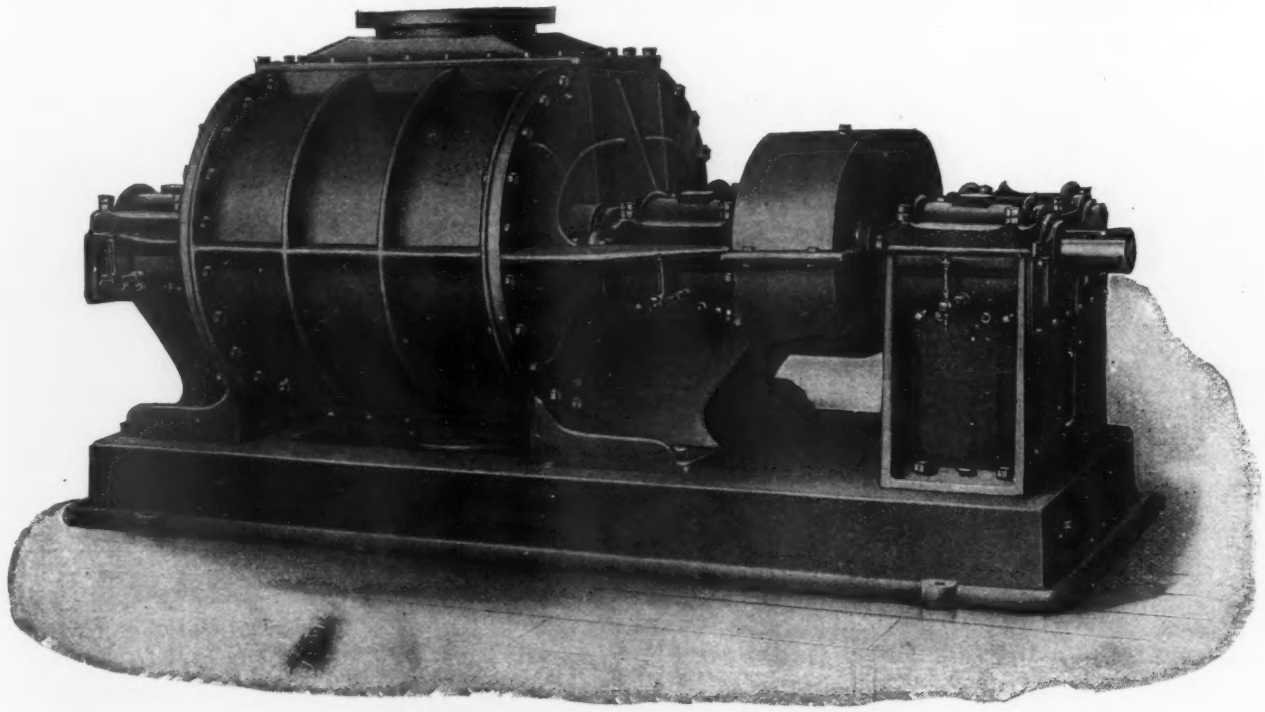

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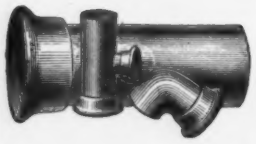

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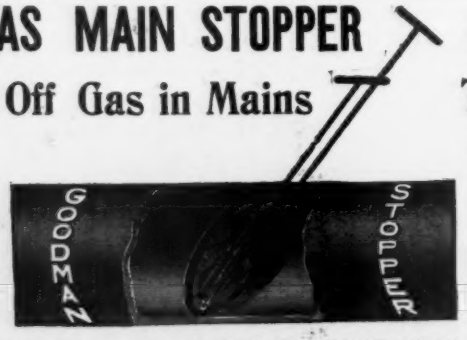
Any size gas main can be shut off in 30 seconds. : : :



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PUBLIC LIGHTING TABLE.

DECEMBER, 1906.

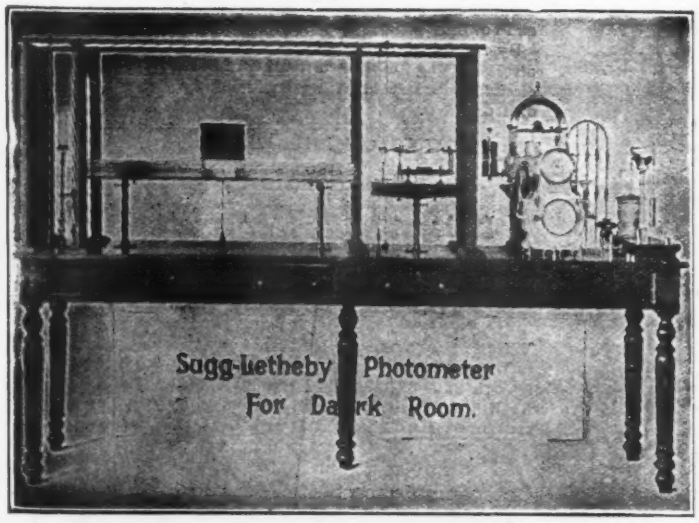
Table No. 1.
FOLLOWING THE MOON.

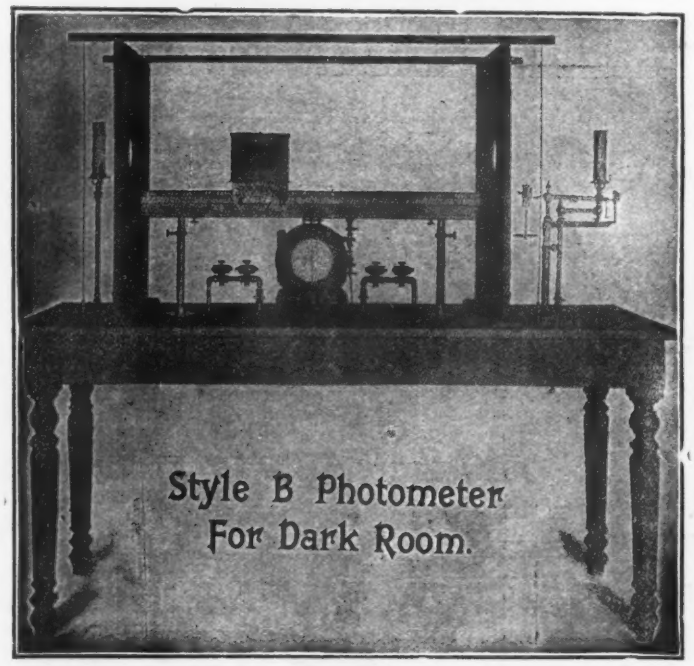
Day of Week.	Date.	Light.	Extinguish.
Sat.	1	No L.	No L.
Sun.	2	5.00 PM	7.10 PM
Mon.	3	5.00	8.00
Tue.	4	5.00	8.50
Wed.	5	5.00	9.40
Thu.	6	5.00	10.40
Fri.	7	5.00	11.40
Sat.	8	5.00 LQ	12.40 AM
Sun.	9	5.00	1.50
Mon.	10	5.00	3.00
Tue.	11	5.00	4.00
Wed.	12	5.00	6.10
Thu.	13	5.00	6.10
Fri	14	5.00	6.10
Sat.	15	5.00 NM	6.10
Sun	16	5.10	6.20
Mon.	17	5.10	6.20
Tue.	18	5.10	6.20
Wed.	19	5.10	6.20
Thu.	20	9.20	6.20
Fri.	21	10.20	6.20
Sat.	22	11.20 FQ	6.20
Sun.	23	12.30 AM	6.20
Mon.	24	1.20	6.20
Tue.	25	2.20	6.20
Wed.	26	3.20	6.20
Thu.	27	4.10	6.20
Fri.	28	5.10	6.20
Sat.	29	No L.	No L.
Sun.	30	No L. FM	No L.
Mon.	31	No L.	No L.

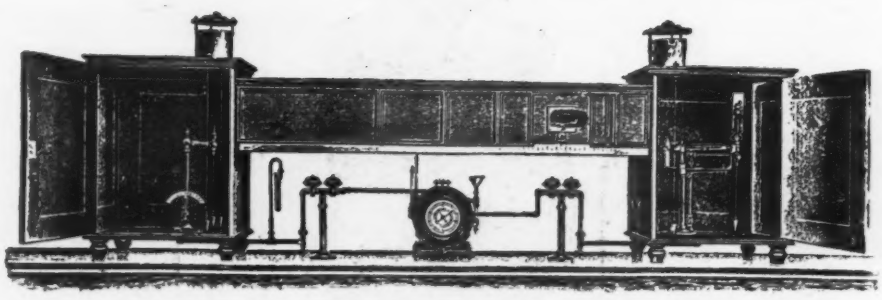
TOTAL HOURS DURING 1906.

By Table No. 1.

	Hrs.Min.
January	223.40
February	190.40
March	192.10
April	167.00
May	152.20
June	142.10
July	150.20
August	157.40
September	170.00
October	185.10
November	201.40
December	214.00
Total, yr.	2146.50







Closed Photometer For Light Room.

CIRCULARS SENT ON REQUEST.

PUBLIC LIGHTING TABLE.

DECEMBER, 1906.

Table No. 2.
NEW YORK CITY.
ALL NIGHT LIGHTING.

Day of Week.	Date.	Light	Extinguish.
		P. M.	A.M.
Sat.	1	4.20	6.10
Sun.	2	4.20	6.10
Mon.	3	4.20	6.15
Tue.	4	4.20	6.15
Wed.	5	4.20	6.15
Thu.	6	4.20	6.15
Fri.	7	4.20	6.15
Sat.	8	4.20	6.15
Sun.	9	4.20	6.15
Mon.	10	4.20	6.20
Tue.	11	4.20	6.20
Wed.	12	4.20	6.20
Thu.	13	4.20	6.20
Fri.	14	4.20	6.20
Sat.	15	4.20	6.20
Sun.	16	4.20	6.20
Mon.	17	4.20	6.20
Tue.	18	4.20	6.20
Wed.	19	4.20	6.20
Thu.	20	4.20	6.20
Fri.	21	4.20	6.20
Sat.	22	4.20	6.20
Sun.	23	4.20	6.20
Mon.	24	4.20	6.25
Tue.	25	4.20	6.25
Wed.	26	4.20	6.25
Thu.	27	4.20	6.25
Fri.	28	4.20	6.25
Sat.	29	4.20	6.25
Sun.	30	4.20	6.25
Mon.	31	4.20	6.2..

TOTAL HOURS DURING 1906.

By Table No. 2.

	Hrs.Min.
January	423.20
February	355.25
March	355.35
April	298.50
May	264.50
June	234.25
July	243.45
August	280.25
September	321.15
October	374.30
November	401.40
December	433.45
Total, yr.	3987.45

NEW YORK, 318 West 42d Street.
BOSTON, 820 Beacon Building.
PHILADELPHIA, Broad and Arch Streets.
ST. LOUIS, 712 Roe Building.
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....OF AMERICA....

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By means of the Welsbach System of street lighting the superiority of GAS over electricity for street lighting has been fully demonstrated.

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It is { Economical, Attractive, Successful, Up-to-date.

IT LIGHTS THE STREET.

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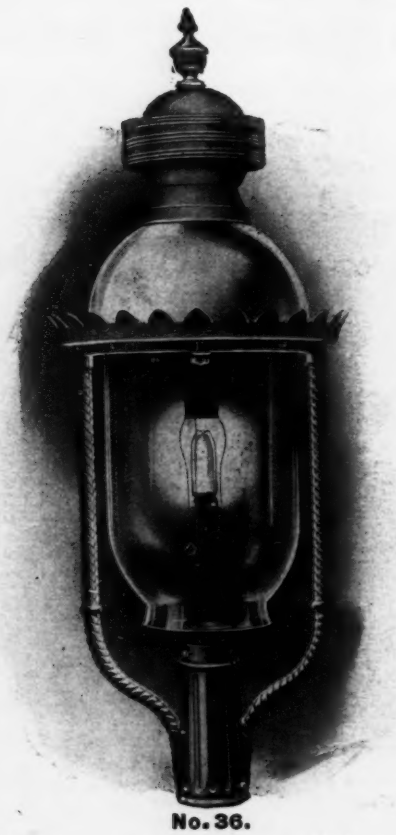

No. 36.

No. 38.

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Will Fit Any Fixture.
Will Not Flash Back.
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Kirksville, Mo.	**Manchester, N. H.**	**New York,** Cent. Un. (3d contract).
St. Johnsbury, Vt.	**Allentown, Pa.**	**Jefferson City, Mo.**
Memphis, Tenn. (2d contract).	**Omaha, Neb.**	**Peekskill, N. Y.** (2d contract).
Council Bluffs, Ia. (2d contract).	**Muskegon, Mich.**	**Waterville, Me.**
Seattle, Wash. (2d contract).	**Nazareth, Pa.** (2d contract).	**Washington, D. C.** (3d contract).

TOTAL SETS TO JULY 1, 1906, - - - - - 618

TOTAL DAILY CAPACITY TO JULY 1, 1906, 488,930,000 CUBIC FEET.

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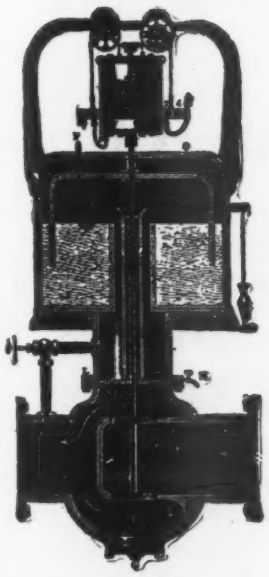

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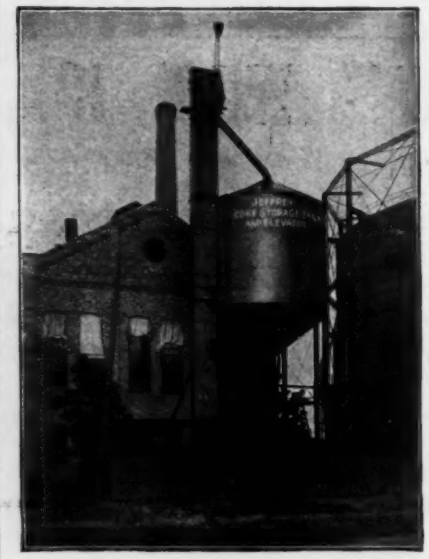

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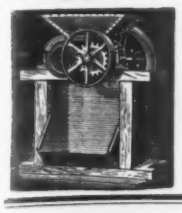

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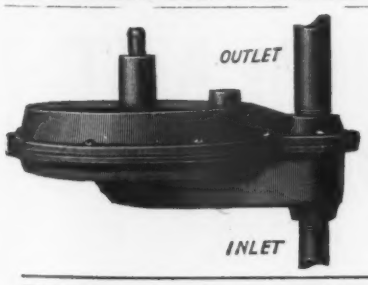

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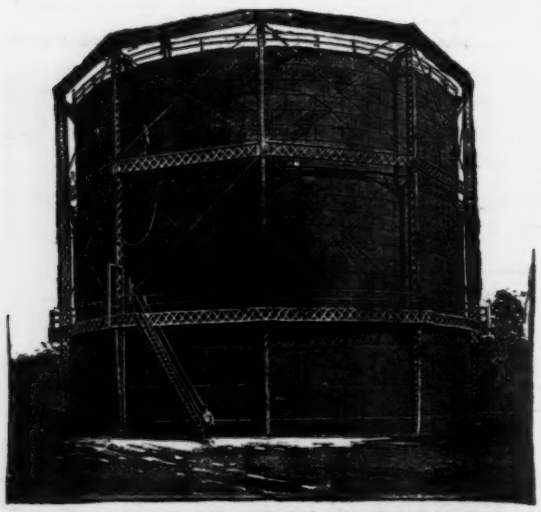

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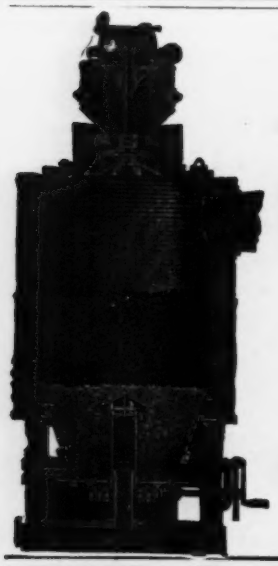

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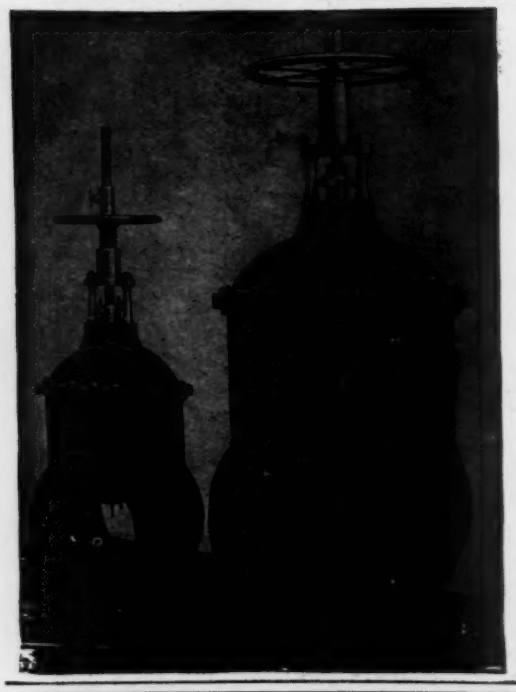

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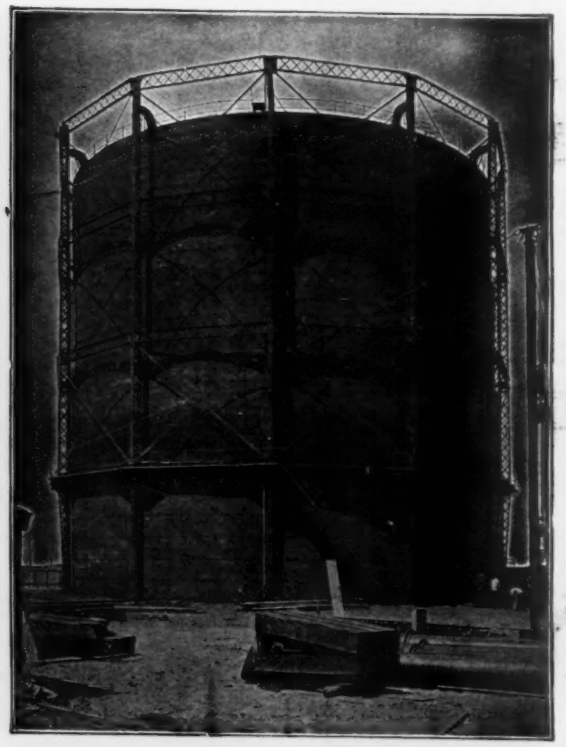

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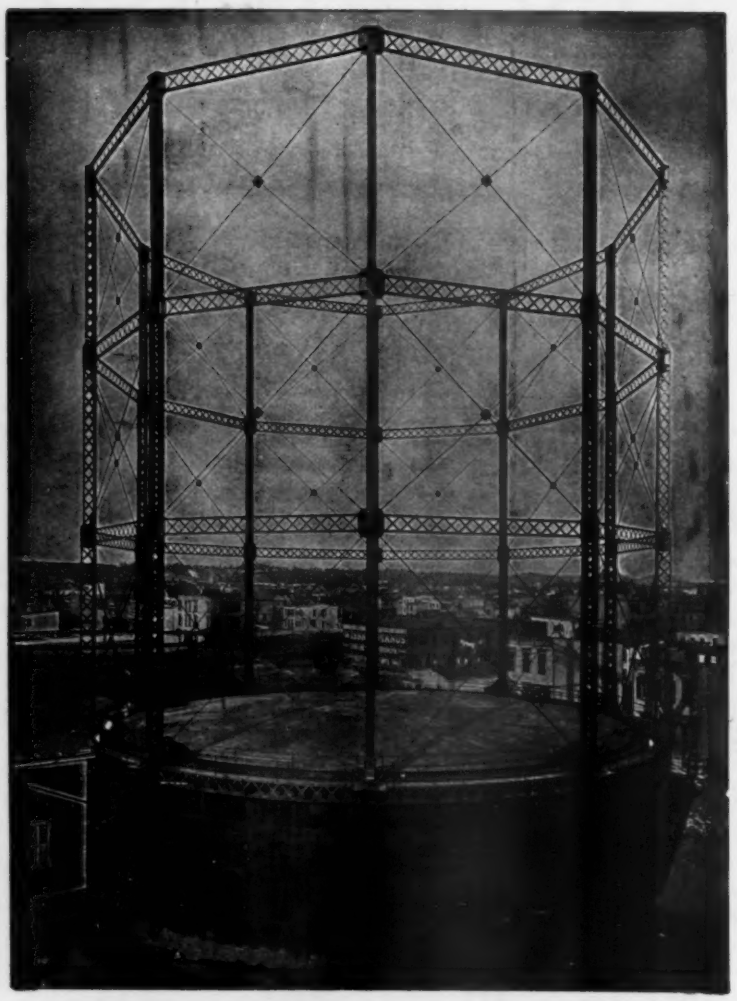

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